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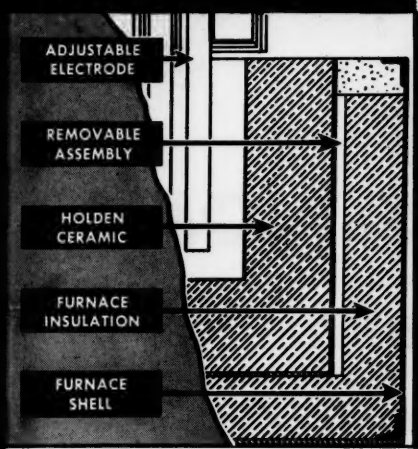

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Metals Review

THE NEWS DIGEST MAGAZINE

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VOLUME XXII, No. 7 — **JULY, 1949**

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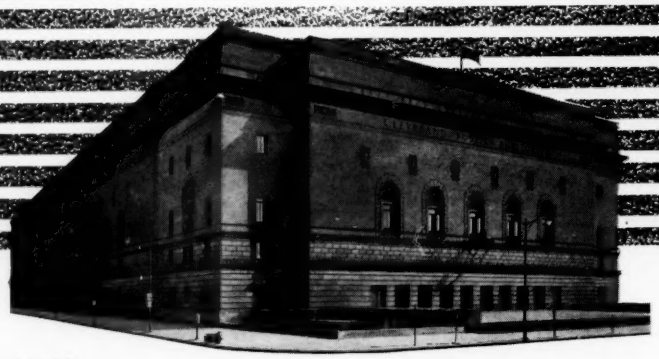

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Heat Treating Theory and Practice

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Theoretical Advances Take the Line of Austenite Decomposition and Toolsteel Treatment; Practical Developments Are in High-Speed Gas Heating, Induction, Case Hardening and Atmosphere Control

By A. M. Hall

STEEL IS heat treated to develop certain desirable conditions or properties. Heat treatment effectively alters such mechanical properties as tensile strength, yield strength, hardness, ductility, fatigue strength, and toughness, as well as such physical attributes as magnetic and electrical properties. Heat treatment may relieve undesirable internal stresses, improve machinability, impart wear resistance, induce formability, or produce dimensional stability.

It is now appreciated that the key to heat treating is microstructure, and the purpose of a heat treating cycle is to obtain a specific microstructure which possesses the properties desired for a particular application.

The literature of the past 12 months reflects much serious thought and study on the practical as well as on the theoretical aspects of heat treating. While it is frequently necessary for heat treating to bridge metallurgical gaps between fabricating operations or between fabrication and use, it is also mandatory that the heat treating engineer help improve productivity and efficiency. To this end he is accelerating the adaptation of his processes to mass production, to automatic control, to use of cheaper steels, and to standardization of product.

Austenite Decomposition

Turning to theory of austenite transformation and hardening of steel, Mehl (4b-47, Sept. 1948)* focused his study on transformation to pearlite, bainite, and pro-eutectoid products—that is, transformation involving nucleation and growth processes. (Martensite formation is considered to take place by a shearing mechanism which does not involve nucleation and growth.)

Past and present theory on hardening and tempering is covered by Austin (4b-51, Sept. 1948). The famous French scientist Le Chatelier, he points out, anticipated and succinctly described the essential features of the isothermal transformation of austenite at subcritical temperatures. Le Chatelier reminded metallurgists that the speed of transformation at a critical point follows the same laws as govern all chemical phenomena: the speed increases (*a*) as the absolute temperature increases and (*b*) as the range between the actual temperature and the equilibrium temperature is widened. Thus, above the critical (equilibrium) temperature, both influences work together and transformation speed increases without limit; below the critical point, they oppose each other and necessarily give rise to a maximum speed at some subcritical temperature. Le Chatelier stated that it is hardly possible to raise the transformation temperature more than 100°C. by very fast heating, while on cooling the speed reaches a maximum at about 600° C., is very feeble below 200° C., and nearly nil at room temperature. Subsequent studies show that this is precisely what happens. Austin also reminds us that we are still not clear as to why martensite is hard, though we talk vaguely about its tetragonal lattice, distorted by the presence of carbon atoms and possessed of no planes of easy slip.

Relating theory to practice, Hodge (18b-108, Sept. 1948), reviews the advantages of hardening, normalizing, annealing, and spheroidizing by isothermal, or nominally isothermal, cycles, while Aborn (18B-17, March 1949), discusses the principles, limitations, and advantages of martempering. Some question has arisen concerning the retention of austenite at room temperature by this heat treating process. There is room to speculate that, depending on such factors as the M_s temperature of the steel, martempering may favor greater austenite retention than do conventional hardening methods.

Two studies have been reported that will materially improve our understanding of the stabilization of austenite in ferritic steels at subcritical temperatures (4b-84, Nov. 1948; 4b-104, Jan. 1949). They show that the M_s temperature is depressed as the austenitizing temperature is increased—that is, as increasing amounts of carbide are placed in solution — and, as expected, the amount of austenite retained at room temperature increases as the M_s temperature is lowered. Martensite formation curves were found to conform to a single empirical equation with M_s temperature the only metallurgical variable; the per cent martensite at temperature, T, depends primarily on $M_s - T$.

In Harris and Cohen's experiments (4b-84, Nov. 1948), if austenite transformation was interrupted by holding at temperature, T_h (provided T_h was below a critical temperature, σ_s), stabilization would ensue. On further cooling, transformation was inhibited till M'_s was reached, where the reaction began again and proceeded parallel to the unstabilized transformation curve. The constant displacement between the two curves was the per cent transformation that would have occurred between T_h and M'_s had there been no interruption; it was now lost to the transformation and, though a little of it transformed to bainite, most of it remained as retained austenite. As M_s was lowered, so was σ_s but not so fast; consequently, σ_s might sometimes lie above M_s and stabilization might occur in the absence of martensite. The degree of stabilization increased the higher the holding temperature below σ_s. It was also influenced by cooling rate during continuous cooling to the extent that, the slower the cooling below σ_s, the greater the degree of stabilization.

Using three steels of approximately equal hardenability — namely, S.A.E 5140, 2340, and T1340—Troiano (4b-67, Nov. 1948) showed that, although the hardness values at each given position on the Jominy bar may be essentially the same among several different steels, the steels may, nonetheless, differ considerably in their transformation characteristics and possess different microstructures at each corresponding Jominy position. At all corresponding positions on the bar, S.A.E. 2340 retained slightly more austenite than T1340 and substantially more than 5140. This, however, was balanced by the presence of more martensite, so the hardness at each position was about the same among the steels. Hence, the Jominy curve is considered, from these data, to be limited as a means of comparing steels even of comparable hardenability. Variations in structure could exist which are not

* The literature references are cited by the corresponding item number in the Review of Current Metal Literature instead of repeating the entire title, author, and source; this information can be obtained by referring to *Metals Review* for the month indicated.

evident from hardness data alone.

The propensity of nickel to depress the equilibrium temperature and to retard transformation has been demonstrated by two papers: Scott, Armstrong, and Forward (4b-69, Nov. 1948) cover the range from 0 to 5% Ni at the level of 0.55% C with and without 0.35% Mo, while Sheehan, Julien, and Troiano (4b-70, Nov. 1948) deal with nickel contents between 5 and 10% at carbon levels of 0.50, 0.80 and 1.2%. As nickel content was increased to substantial amounts, retardation of the pearlite reaction became especially pronounced. At and above 7.5% Ni no pearlite formation whatever was observed; transformation to bainite, to pro-eutectoid products and bainite, or occasionally to carbide and ferrite took place. Even at 5% Ni the bainite reaction was dominant, being operative high in the pearlite range. The appearance of pro-eutectoid ferrite was retarded to a greater degree in the molybdenum-bearing series than in the molybdenum-free steels, the time required for the first appearance of ferrite being approximately ten times that in the molybdenum-free steels.

Apropos of these transformation studies and the work of Cohen and Harris on retained austenite, the new low-carbon 8 to 10% Ni steel recently developed for service down to −320° F. may be noted. To obtain the required low-temperature toughness, this steel must have a low carbon content, be fully killed, and be carefully heat treated to insure that its structure will be essentially ferrite plus stable austenite. The treatment recommended by Brophy and Miller (18b-136, Nov. 1948) is directed toward austenite stabilization and consists of double normalizing at 1650 and 1450° F. followed by a draw at 1050 to 1075° F and a reheat at 800 to 900° F. for stress relief.

While the TTT-diagram shows the sequence and timing of structural changes occurring after quenching suddenly to any subcritical temperature and holding there, these often differ from the transformations during continuous cooling. Jominy tests, on the other hand, show the results of a large number of continuous cooling rates, from fast to slow, but do not indicate the sequence nor the timing of structural changes. Beginning a few years ago, Liedholm worked out a method of combining certain features of both techniques into a continuous cooling chart. His diagram was obtained by end-quenching a series of Jominy bars for various periods of time and then terminating each end-quench with a complete immersion quench, thus "freezing" transformation after it had been allowed to occur, during cooling, to various different extents.

The plot consists of a temperature ordinate, a log-time abscissa, and a series of cooling curves, one for each station on the Jominy bar. On these curves are indicated the microstructures obtained after different extents of end-quenching, and phase fields are marked just as in TTT-diagrams. Liedholm's most recent continuous cooling diagram is for the transformation of S.A.E. 4330 steel (4b-105, Jan. 1949).

Toolsteels

The M.I.T. group led by Cohen has continued to examine the changes occurring in hardening and tempering toolsteels, with special emphasis on dimensional stability (4b-66 and 18b-135, Nov. 1948). They have studied plain carbon toolsteels, steels of the S.A.E. 52100 type, as well as the high-alloy types.

Dimensional stability, they found, is a function of the amount and nature of the martensite and austenite present. The contraction due to tempering martensite is calculable and additive; the larger the martensite contraction during tempering, the less shrinkage might be expected during subsequent aging at room temperature. Rate of martensite shrinkage is a function of martensite composition; chromium lowers the rate because it increases the capacity of martensite for carbon at the end of the first stage of tempering, thus reducing the amount of precipitation taking place during low-temperature tempering. Retained austenite can also decompose at low aging temperatures; its decomposition produces an expansion which is a major factor in the cracking propensity of hardened toolsteels allowed to age at room temperature after quenching. Tempering very soon after hardening is indicated.

Achievement of dimensional stability depends on minimizing both the contraction due to martensite decomposition and the expansion due to austenite transformation at room temperature. Ideally, both could be done by tempering at a high enough temperature to eliminate martensite and retained austenite. However, this would produce too much softening and a compromise is required. To minimize contraction due to martensite decomposition, preshrinkage by tempering as high as hardness requirements will permit is necessary. Such alloying elements as chromium, tungsten and manganese tend to decrease the extent of martensite decomposition in the first stage of tempering. To minimize expansion due to austenite decomposition, it is necessary to stabilize it by tempering.

For low-alloy steels, extent of stabilization increases with increase in tempering temperature. For high-alloy steels, however, high tempering temperatures condition retained austenite for decomposition to martensite during cooling from the tempering temperature and while at room temperature. For high-alloy toolsteels, high tempering temperatures are needed to secure secondary hardening. Accordingly, a triple tempering operation, with an oil quench from the tempering temperature and a final stress-relief heat treatment, is used to convert all retained austenite to martensite and to decompose all martensite to the requisite extent.

A comprehensive investigation has been made to determine whether secondary hardening is possible in a martensitic alloy steel essentially free of retained austenite on quenching and possessing no precipitation-hardening tendencies. Crafts and Lamont (18b-144, Nov. 1948) found that such secondary hardening could reach a maximum hardness comparable with that of quenched martensite itself. This was done without the aid of retained austenite or precipitation hardening, although appreciable secondary hardening can be induced by these reactions in steels of the appropriate composition and heat treatment.

The degree of secondary hardening depends on the alloying elements present and on the quantity of alloy and carbon present in the ratio of the alloy carbide. Vanadium and tungsten produce considerable secondary hardening, while chromium does not induce rehardening but is effective in retarding softening at the lower tempering temperatures. The mechanism of rehardening appears to involve the formation of minute alloy carbide particles through the local contraction of thin transitional films or plates of iron carbide.

Dealing with the practical metallurgy and heat treatment of cutting tools, Leckie-Ewing (18b-10, Feb. 1949) stresses the prime importance of the raw material as a factor in tool quality. The stock must be free of gross defects such as seams, laps, center bursts, and porosity. It must be up to standard chemically, and its annealed microstructure should contain evenly distributed "pinpoint" carbides. Steel containing massive carbides, or carbides in eutectic or other patterns indicative of inhomogeneity, or in streaks, is highly undesirable. Large, unevenly dispersed carbides lead to lowered response to hardening, to irregularity in hardness across the section, and to excessive brittleness.

Brancroft and Wight (18b-55, May 1948) consider the heat treating cycle for high-speed steel cutting tools. Commonly accepted practice, they point out, is to quench from high heat to 1000 to 1200° F. and air cool to room temperature. Cooling to room temperature by any method leaves some 15% of the austenite untransformed and makes multiple tempering highly advisable. The first tempering cycle tempers and stress-relieves the original martensite, and conditions the retained austenite so it will transform to martensite on cooling to room temperature; the second cycle tempers and stress-re-

lieves the new martensite. Usually, if the high speed steel is tempered much below its secondary hardening range, the retained austenite will not transform completely on cooling, and the steel, though fairly tough, will be unstable; for satisfactory stability the steel should be tempered well into the rehardening range, though this may reduce hardness and toughness below the maximum.

Because of the inherent opposition between hardness and toughness, high toughness, of course, cannot be secured, but it should be adequate to insure successful use of the tool. In applications such as lathe and planer tools, and tool bits, toughness need not be considered much, while in others such as milling cutters, taps, and drills, hardness may have to be sacrificed somewhat to toughness. Low austenitizing temperatures favor toughness; they reduced response to hardening and prevent grain coarsening.

Multiple tempering—first to transform the austenite retained after quenching and then to temper the new martensite resulting from the transformation—is usually considered applicable specifically to high-alloy toolsteels and is seldom used on low-alloy steels, probably because it is thought that practically all their austenite transforms to martensite on quenching. However, Berman (18b-110, Sept. 1948) reports the multiple tempering of screwdriver bits made of a steel with 0.50% C, 0.40% Mn, 1.00% Si, 0.50% Mo. Torque values were originally less than 35 in-lb., but with a multiple temper, 48 to 61 in-lb. was obtainable. The heat treatment was an oil quench from 1600° F. and temper at 200, 300, 400, 500 and 600° F., air cooling between each reheat.

High-Speed Gas Heating

The whiplash of economics has forced a keen interest today in the potentialities of rapid gas heating methods in heat treating steel as well as in heating for forging and brazing. High speed means high productive capacity; it may also mean reduced capital outlay per piece, reduced floor space, improved surface condition of the work, and fewer rejections of finished articles. Gas is clean, easily controlled, and fairly cheap.

In the heat treatment of steel, rapid gas heating applications fall into two general categories—surface hardening, which also includes most flame-hardening techniques, and through hardening, of which little use is as yet made.

A type of heating unit which has greatly facilitated the development of high-speed heating is a multiple-orifice ceramic panel (16a-97, Dec. 1948). A compact, intimate gas-air mixture enters and burns at very high rates with the development of flame temperatures up to 3000° F. The temperature of the work may be

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automatically controlled by the spacing of the panel from the work and by adjustment of the air-to-gas ratio.

In numerous instances rapid gas heating methods do the job at low cost and without exorbitant capital outlay; but, where very shallow hardening is required, gas must bow out at present and leave the field to other methods such as induction heating, because it is thus far unable to develop a high enough heat input. (16a-68, Sept. 1948).

Flame hardening is in every way a rapid gas heating technique, though the gas used is generally acetylene rather than the usual fuel gases, and metal orifices and burners are used instead of refractory panels. Flame hardening techniques have been used for many years but it is now becoming apparent that the process can often be adapted to precise regulation, automatic control, and mass production. Applications include such items as valve stems, bearing buttons, shafts, pulleys, gears, pinions, machine tool ways, punches, and dies (18b-91, July 1948). The process is used primarily to enhance the wear resistance of a surface, leaving the underlying metal as a tough, shock resistant support; it is especially applicable where through hardening is undesirable, if not unacceptable.

In describing the use of flame hardening in locomotive manufacture, Burg (18b-148, Dec. 1948) stresses the point that good set-ups, provided with accurate automatic control, can readily be custom built for the job by the user and often at very low cost. The method is quick, clean, economical, and is adaptable to a wide variety of sizes and shapes. It can usually handle small quantities as readily as large quantities of work. Both Burg and Rosengren (18b-91, July 1948) recommend steels in the range 0.35 to 0.60% C—enough carbon to respond to heat treatment but not so much as to invite cracking.

High-speed gas heating for a through hardening application is exemplified by an installation for the continuous hardening and tempering of farm machinery drive chain, stamped and joined out of S.A.E. 1030 steel strip (18b-159, Jan. 1949). Both furnaces are vertical and of open-muffle type. The chain feeds down through the hardening furnace into the quenching bath, then up to the top of the draw furnace and down through it to takeup reels. The speed is 8 to 12 feet of chain per min. depending on chain size.

Induction Heating

Induction heating has demonstrated its ability to cut manufacturing costs. It is a high-speed operation, readily adapted to precise automatic control and suited to mass production. It is clean and compact and hence can be located in the production line. Surface effects, like decarburization and scaling, are held to a minimum or are eliminated entirely because of the rapidity of the heating. On the other side of the ledger is the initial cost of the equipment, which is usually greater than the cost of equipment for heating by other methods.

Four sources of power are in use: the motor alternator operating at frequencies of 1000 to 10,000 cycles per sec., vacuum tube oscillators for frequencies of 450,000 cycles per sec. and up, mercury-arc converters used at 500 to 1500 cycles per sec., and spark gap oscillators usually operating in the range 15,000 to 30,000 cycles per sec. According to Vicker (18a-15, Aug. 1948), where its output frequency is high enough for the particular application, the motor alternator is highly favored because of its relative ease of maintenance.

Frequency is an important factor because it is one of the three factors controlling the depth to which the work is heated (18b-32, March 1949). The higher the frequency, the shallower is the depth of heat penetration. For very shallow hardening applications a motor generator may not be able to supply an output of high enough frequency. Vacuum tube oscillators are popular where high frequencies are needed.

The other factors influencing depth of heating are rate of energy input, (which is a function of the power source and the design of the installation) and the prior microstructure of the work. The latter has been discussed in detail by Libsch (18b-151, Dec. 1948) and by Brown (18b-164, Jan. 1949). An essential difference between induction heating and conventional heating, which makes the results particularly sensitive to prior microstructure, is the extremely rapid heating rate usual in induction

methods, together with an almost zero holding time at temperature. This means that little time is available for carbide solution and almost no time for homogenization of the austenite formed. A high degree of homogeneity in the initial structure is therefore required.

To give a uniform austenite in a minimum of time, Brown points out the desirability of a prior microstructure consisting of tempered martensite. Libsch indicates the advisability of using steels with low critical temperatures, thus permitting a longer time in the austenite region with attendant increased carbide solution and improved homogeneity. Certainly, prior structures consisting of massive ferrite and coarse pearlite are to be avoided, for heating and holding time will probably not permit sufficient carbide solution and homogenization for the production of a uniform product with a satisfactorily high order of hardness.

An important advantage of induction hardening is that it frequently permits the use of lean alloy or plain carbon steels in place of medium and high-alloy steels. Vicker mentions the substitution of S.A.E. X1335 and S.A.E. 1045 steel for high-alloy steel in automotive gears (18a-15, Aug. 1948). The gears were formerly machined from alloy steel and hardened conventionally but are now cut from the plain steel in the soft condition and then induction hardened. Hunt (18b-77, July 1948) describes a recent induction heating installation for surface hardening passenger car axle shafts to Rockwell C-55 at a depth of 0.125 in. By switching to induction heat treating, S.A.E. 1033 steel could be substituted for the S.A.E. 4140 formerly used.

Case Hardening

When processing or other requirements dictate the use of low-carbon steel but service conditions demand a strength higher than that obtainable with low carbon content, carburizing or nitriding is frequently resorted to. Advantage may then be taken of the ease of forming, superior weldability, and low cost of the low-carbon steel, with the added advantage that, by a furnace treatment, the surface of the material may be transformed into a hardenable steel.

There are instances, however, like springs, where high surface hardness is not enough, and where strength requirements cannot be met by hardening the surface only (18b-97, Aug. 1948). Taking a new approach to this problem, low-carbon or low-alloy steel was used for the part and then, after fabrication, the part was effectively through carburized to the point where the higher carbon content prevailed throughout the section.

Two carburizing techniques are possible. In one, the carburizing atmosphere is kept uniform, with the carbon potential of the atmosphere maintained constantly at the point where it is in equilibrium with the carbon level desired in the steel; exposure time is long, but the process is easily controlled and especially applicable for pieces of variable thickness. In the second, the atmosphere is varied, starting with a high carbon potential to get a quick build-up of carbon in the steel, and following with a diffusing period at a lower carbon potential and a higher temperature; this process is quicker but tends to leave thin sections very high in carbon.

The clutch spring on Buick motor cars is an example of a through carburized part. It had formerly been made of S.A.E. 1065 steel sheet, which had to be bought cross rolled and speroidized to keep heat treating distortion to a minimum. It also had to be purchased oversize so that decarburization could be removed by grinding to size after heat treatment following forming. The new practice uses S.A.E. 1015 strip ordered to size, not specially rolled or treated —a much cheaper raw material. After forming, it is through carburized to 0.45 to 0.50% carbon by the second method described above.

Selby and Rowland (18b-72, June, 1948) report an investigation of deep freezing as applied to carburized medium-alloy steel parts. The purpose was to increase the amount of austenite transformation in the case, and the authors report significant hardness increases after subzero treatment. They found no evidence that the product of the subzero treatment is better or different from that obtained by double quenching and, in view of the expense, they consider that it offers no advantage over double quenching where distortion is no problem, that is, where grinding is permissible. However, where minimum distortion is of primary imporance (where the part cannot be subsequently ground, such as automotive gears), deep freezing might permit use of a single instead of a double quench, with a concomitant reduction in distortion.

Roberts (18b-125, Oct. 1948) notes renewed interest in carburizing high speed steel for certain applications such as blanking, trimming, and forming dies. The purpose is to increase the wear resistance of the surface. A popular treating cycle is pack carburizing at 1950° F. for 20 to 40 min.

The process of Malcolmizing (18b-12, Feb. 1949) is a method of nitriding applicable to all the basic types of stainless steel; its purpose is to produce articles or parts in which the high corrosion resistance of the stainless steels is combined with the wear resistance and fatigue strength usual in surface-hardened material. In this process dissociated ammonia first reduces any oxide on the surface of the work, after which the ammonia is ionized and is then used to add nitrogen to the work. The nitrogen absorbed in the steel combines with chromium and forms a fine dispersion of insoluble chromium nitrides which puts the surface under a high degree of internal compressive stress. The ammonia is dissociated at 1400° F., reduction of oxides takes place at 850° F., and nitriding is done at 920 to 1050° F. for 30 hr. to produce a case depth of 0.015 in. Applications are disks and seats for high-temperature, high-pressure valves, pistons, cylinders, and guide bushings, piston rods for high-pressure refinery pumps, aircraft instrument parts and accessories, trimming and coining dies, and mandrels.

Furnace Atmospheres

A series of articles by Harris (16a-60, Aug. 1948; 18b-112, Sept. 1948) reviews the fundamental chemistry of controlled gas atmospheres designed to protect the work. The ideal "carrier" or "base" gas should be cheap, relatively inert to steel, nonexplosive when mixed with air at low temperatures, and its capacity for decarburization should be easily checked and verified. He recommends 20% CO, balance N_2, as ideal; to this, additions of other gases can be made as desired depending on whether protection or carburization is wanted.

Oxide coatings can be formed intentionally by use of steam mixed with a little air; the temperature range of the operation is 700 to 1300° F. A somewhat porous oxide coating is obtained; it is capable of retaining oil to a much better extent than is a finished bare-metal surface, and can be satisfactorily burnished.

Various kinds of special gas atmospheres are available for use in heat treating furnaces, but no gas is perfect as a protection for steel, according to Koch (16a-40, June 1948). The best are either expensive, like pure nitrogen, or expensive and explosive, like ammonia. A good compromise is the combusted gas atmosphere, separately generated and cooled to remove water vapor.

While former opinion was that, generally, the higher the CO content of the gas, the better the protection for high carbon steel and the more effective the gas carburizing, it is now believed that the action of the gas atmosphere is determined by the $CO:CO_2$ ratio correlated with the temperature and the steel (18b-116, Sept. 1948). The ratio of CO to CO_2 determines the carbon potential of the atmosphere. The relation of this carbon potential to the carbon content of the steel determines whether the steel will be carburized, decarburized, or left unaffected by the atmosphere. The CO content need not be high to protect a steel, if CO_2 is low or absent. However, high-carbon steels at high temperatures can tolerate only very small amounts of CO_2 in the atmosphere before decarburization occurs.

Committee Completes Preliminary Draft of Classification System

The first draft of a "Classification of Metallurgical Literature" has now been completed by the committee sponsored jointly by the American Society for Metals and the Special Libraries Association, according to T. D. Yensen, chairman of the committee.

The classification system has been designed to serve a three-fold purpose: (a) provide a logical and fairly simple breakdown of the entire metallurgical field which can have universal applications in classifying the literature; (b) serve as a guide for a punch card filing system that can be used by the individual metallurgist or research worker for his own data collections; and (c) provide a pattern for classifying the abstracts published in the A.S.M. Review of Metal Literature.

Copies of the classification, together with description of a suitable punch card and coding system, have been circulated to various technical societies, engineering colleges, and technical libraries for comments and criticism, and for amplification of the various main sections. These comments and criticisms will be assembled and collated during the summer for consideration by the committee at a meeting in October, when the final draft of the system can be drawn up.

The final version will then be published by the American Society for Metals or otherwise made available to anyone wishing to make use of it. Punch cards of the design eventually adopted will be printed in quantity lots and will be available on order from A.S.M.

Such a standardized classification scheme, together with a simple method of coding and filing of references on punch cards, is expected to simplify the problem of keeping up with the ever-increasing bulk of technical literature necessary to the research worker.

Membership of the Literature Classification Committee is as follows: T. D. Yensen, manager, magnetic department, Westinghouse Electric Corp. (chairman); A. H. Geisler, Knolls Research Laboratory, General Electric Co.; F. T. Sisco, director, Engineering Foundation; Miss Meredith S. Wright, librarian, National Carbon Co., Inc.; Robert W. Kollar, librarian, Republic Steel Corp.; W. W. Howell, technical abstractor, Battelle Memorial Institute; Taylor Lyman, associate Editor of *Metal Progress* and editor of Metals Handbook; Henry P. George, metallurgist, Frankford Arsenal; Marjorie R. Hyslop, editor, *Metals Review* (secretary).

Foundry Training Film Offered

An educational training film entitled "Molding on a Jolt Roll-Over Pattern Draw Machine" is being offered by the Cooper Alloy Foundry Co., Hillside, N. J., to any engineering school, society or club interested in foundry practices. The 22-min. 16-mm. film will be furnished free on request.

Applications for use of the film should contain the date it is to be used and some information as to the type of group who will view it. Address applications to the attention of Miss R. B. Kubert, librarian, Cooper Alloy Foundry Co., Hillside, N. J.

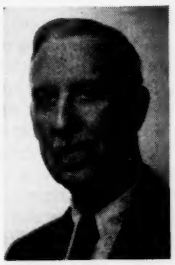
President Congratulates New Chairman

At National Officers' Night of the Washington Chapter A.S.M. Held on May 9, President H. K. Work (Right Center) Congratulates the Newly Installed Chapter Chairman, Thomas E. Hamill. Looking on are Col. Merle H. Davis, toastmaster for the evening, and Herbert M. Frazier, retiring chairman. (Reported by Melvin R. Meyerson)

Compliments

To EDWIN D. MARTIN, assistant manager of the metallurgical and inspection department, Inland Steel Co., on the award of the American Iron and Steel Institute Medal for his paper on "Continuous Strip Pickling" presented at the Institute meeting in 1948.

♦ ♦ ♦



To GEORGE B. WATERHOUSE, professor of metallurgy, emeritus, Massachusetts Institute of Technology, and past national president of the American Society for Metals, on the award of the honorary degree of Doctor of Engineering by Nova Scotia Technical College. Dr. Waterhouse also presented the convocation address.

♦ ♦ ♦

To CARL A. ZAPFFE, consulting metallurgist, and Miss M. E. HASLEM, research chemist, on the award of a certificate of honorable mention by the Wire Association for their paper on "Evaluation of Pickling Inhibitors From the Standpoint of Hydrogen Embrittlement".

♦ ♦ ♦

To A. W. WINSTON of Dow Chemical Co. on his appointment as president for 1949-50 of the Magnesium Association.

♦ ♦ ♦

To CLARENCE W. DANIELS, plants engineer and a director of Norton Co., on his retirement after 36 years of service with the company.

♦ ♦ ♦

To WILLIAM E. BORBONUS, president of R-S Products Corp., on his election as president of the Industrial Furnace Manufacturers Association; also to HENRY HEYN of Surface Combustion Corp., MATT SNODGRASS of Gas Machinery Co., and CHARLIE KENTNOR, JR., of W. S. Rockwell Co., on their election as directors of I.F.M.A.

♦ ♦ ♦

To KARL ELERS, assistant manager of sales for the Chicago district, Allegheny Ludlum Steel Corp., on receipt of one of the company's awards, consisting of the President's Medal, a citation and $1000 in cash. The award is in recognition of his efforts in developing arrangements for the use of stainless steel wire mats by the U. S. Corps of Engineers in the Mississippi River flood control program.

♦ ♦ ♦

To WALTER R. COLEY, a vice-president of Leeds & Northrup Co., on his retirement after 43 years of service with the firm.

Annual Symposium On Thermodynamics

"Thermodynamics in Physical Metallurgy" is the subject of the two-day symposium planned for this year's National Metal Congress in Cleveland next fall. As in past years, this annual symposium will be scheduled for Saturday and Sunday, Oct. 15 and 16, immediately preceding the opening of the Congress and Exposition.

Clarence Zener, professor of physics, Institute for the Study of Metals, University of Chicago, is organizer and chairman of the symposium series. Papers will be presented by 15 of the country's leading metallurgists, mathematicians, physicists and researchers.

Participating scientists include: P. W. Bridgman, Hollis professor of mathematics, Harvard University; Lawrence S. Darken, research chemist, U. S. Steel Corp.; F. J. Dunkerley, assistant professor of metallurgy, University of Pennsylvania; A. W. Lawson, associate professor of physics, Institute for the Study of Metals, University of Chicago; John Chipman, head of the department of metallurgy, Massachusetts Institute of Technology; C. E. Birchenall, assistant professor, department of metallurgy, Carnegie Institute of Technology; Frederick Seitz, head of the department of physics. Carnegie Institute of Technology; John Hollomon, research associate, General Electric Co.; Charles Wert, instructor, Institute for the Study of Metals, University of Chicago; John Fisher, research associate, General Electric Co.; Morris Cohen, professor of metallurgy, Massachusetts Institute of Technology; Lieuwe Dijkstra, research associate, Institute for the Study of Metals, University of Chicago; D. Turnbull, research associate, General Electric Co.; J. B. Austin, director of U. S. Steel Corporation Research Laboratories.

Retires After 26 Years as Secretary

Chapter Chairman Tim Merrill (Left) Presents to Hiram Walker a Plaque and Lifetime Privileges in the Pittsburgh Chapter in Recognition of His 26 Years as Secretary

Reported by C. T. Haller, Jr.
International Nickel Co., Inc.

An important feature of the May 12th meeting of the Pittsburgh Chapter A.S.M. was the presentation of a plaque to Hiram Walker, who is retiring as chapter secretary after 26 years of service. He will assume the title of secretary emeritus, and his judgment and experience will continue to be available. Mr. Walker was invited to be the chapter's guest at all future meetings and outings.

In 1923, Hiram L. Walker, a charter member, was elected secretary-treasurer of the Pittsburgh Chapter. He was re-elected for the next 24 years, and has witnessed the growth of the Pittsburgh Chapter from 258 to the present 1244 members.

Born on Sept. 11, 1874, Hiram entered the steel industry in 1911, with Crucible Steel Co. of America, La-Belle Works. For 13 years he supervised the warehouse, which included inspection and heat treating of carbon, alloy and toolsteels. In 1924 he joined Jones & Laughlin Steel Corp., South Side Works, but along in 1926 the wanderlust struck him and he resigned and began a 40,000-mile trip around the world.

Since the completion of this trip he has been in semi-retirement from business, and has devoted practically all of his time to the affairs of the American Society for Metals. His devotion to the chapter has been complete. On numerous occasions in the early days Hiram paid the bills out of his own pocket when the treasury could no longer support the activities. However, he likes to point out that he has always been paid in full, and his membership has been one of the greatest satisfactions of his life.

Movie on Al Powders

"The Tale of the Powdered Pig", a new sound and color film, has been released by the Reynolds Metals Co. The film describes the uses to which aluminum powders and pastes are put, ranging from polychromatic finish on automobiles to pyrotechnics and the coloring of a myriad business and household appliances.

The 16-mm. film (running time 30 min.) is available for screening before technical groups and educational organizations. Requests for bookings should be directed to Reynolds Metals Co., Motion Picture Department, 821 South 12th St., Louisville 1, Ky.

Hartford Chapter Honors Past Chairmen at May Meeting

Past Chairmen Were Honored at the May Meeting of the Hartford Chapter A.S.M. In the photograph, left to right, are: J. H. G. Williams, D. A. Tullock, Jr., O. G. Hogaboom, H. J. Fishbeck, C. J. Umlauf, R. W. Woodward, W. P. Eddy, Jr., J. A. Swift, E. E. Thum (speaker of the evening), W. E. Bancroft, W. W. Wight (present chairman), H. J. Noble, C. T. Hewitt, A. H. d'Arcambal, L. A. Lanning, R. J. Haigis, and J. C. Kielman. Mr. Thum addressed the meeting on "Recent Metallurgical Advances". Another feature was the presentation by the Hartford Chapter of a complete set of A.S.M. books and publications, including all back issues of the periodicals, to the Hartford Public Library. The gift was made in memory of David Nemser, a Hartford member recently deceased. (Reported by W. E. Borin, Underwood Corp.)

Educational Course on Castings Covers Iron, Aluminum, Brass and Steel

Reported by Morris Cohen
Massachusetts Institute of Technology

A four-lecture series on "Engineering Properties of Castings" was well attended and warmly received by the Boston membership. The program was arranged under the capable chairmanship of Dow M. Robinson of the New England Metallurgical Corp.

The first lecture on "Modern Cast Iron" was given by Richard Flinn of American Brake Shoe and Foundry Co. The topics covered were castability, microstructure, relation of properties to microstructure, heat treatment and practical application. Dr. Flinn demonstrated how the characteristics and behavior of cast iron can be readily understood in terms of the structures which result from the interplay of cooling rate, composition and heat treatment. Considerable interest was displayed in the newly developed inoculated irons which contain nodular graphite in the as-cast condition.

Myron H. Gould of the Aluminum Co. of America presented the second lecture on "Light Alloy Castings". The commonly used aluminum and magnesium-base alloys were discussed, with emphasis being placed on the strength-vs-weight advantages of these materials. Mr. Gould showed how the properties of these alloys are affected by the type of molding and heat treatment. The design features of light-alloy castings in relation to various industrial applications were also covered.

"Brass and Bronze Castings" was the subject of the third lecture in the series, presented by Clyde L. Frear of the Navy Bureau of Ships. Following a brief discussion of the properties and uses of the common brasses, the speaker turned to the manufacture and inspection of the bronzes. He pointed out that gun metal (88-10-2) and hydraulic bronze (85-5-5-5) possess film-forming characteristics which afford excellent corrosion resistance in salt water. However, for many uses, the castings must be tight under pressure, and in this respect, tin bronzes present serious problems because of their tendency toward porosity. Mr. Frear then analyzed the causes and corrections of porosity in terms of inter dendritic shrinkage and also entrapped and dissolved gases.

The final lecture on "Cast Steel" was given by William J. Phillips of the Steel Founders Society. A detailed comparison was made of steel weldments and steel castings from the point of view of cost, weight and eye-appeal. One interesting example was a poppet valve gear case which required 76 separate drawings when produced from a steel weldment, against one simple set of drawings when cast steel was specified. Mr. Phillips also discussed the importance of heat treatment in attaining high strength in heavy sections, and of chemistry in controlling the propensity toward cracking in water quenching.

Each speaker was presented with an initialed wallet by Chairman Robinson as a token of appreciation.

An Absorbed Class Listens to One of the Lectures in Boston Chapter's Course on Castings. The four speakers are shown in the insets; Mr. Robinson (center) was chairman of the course. (Photo by H. L. Phillips)

New A.S.M. Committee To Study Teaching Of Process Metallurgy

A new committee has been announced by the American Society for Metals whose purpose is to analyze the methods of teaching process metallurgy in technical schools and colleges. The group is actually a subcommittee of the A.S.M. Advisory Committee for Metallurgical Education under the chairmanship of Prof. A. R. Troiano of University of Notre Dame.

Chairman of the Subcommittee on Process Metallurgy is R. Schuhmann, Jr., professor of metallurgy, Massachusetts Institute of Technology. Serving as members of the committee will be Professors J. Gregg, department of metallurgy, Cornell University; T. L. Joseph, assistant dean, Institute of Technology, University of Minnesota; H. H. Kellogg, School of Mines, Columbia University; E. A. Peretti, department of metallurgy, University of Notre Dame; W. O. Philbrook, department of metallurgical engineering, Carnegie Institute of Technology; L. M. Pidgeon, head, department of metallurgical engineering, University of Toronto; A. W. Schlecten, chairman, department of metallurgical engineering, Missouri School of Mines and Metallurgy; and J. P. Spielman, head, department of metallurgy, Montana School of Mines.

"This group of educators will reexamine present methods of teaching extractive metallurgy in both classroom and laboratory with the view of bringing these methods into step with the modern advances in physical chemistry and other allied sciences," Professor Troiano stated. "Professor Schuhmann suggests a clue to the work the subcommittee will do, in his recent paper, 'The Unit Processes of Chemical Metallurgy'. In this paper, Professor Schuhmann presents a new and general classification of metallurgical processes. The subcommittee will explore the opportunities for extending further this idea of orderly practice into the teaching of process metallurgy."

Names California Distributor

A. Milne & Co. of New York has announced the appointment of Taylor-Spotswood of California as distributors for southern California of Milne toolsteels.

Metals Review's Honor Roll of the Well Informed

Correct Answers to the Quiz Questions Published on Page 4 of the May Issue of Metals Review Were Received From the Following Readers

Mervin S. Allshouse, Jr., metallurgical engineer, Midvale Co.

Robert L. Baldwin, chief chemist, Stanley Works; Alvin E. Beetham, dispatcher, Western Gear Works; M. F. Behar, editor, *Instruments;* Oscar J. Binder, metallurgical department, Brite Manufacturing Co.; Dale Bittinger, assistant superintendent, sheet mill, Jessop Steel Co.; W. W. Brenneman, metallurgical department, Lima-Hamilton Corp.; C. F. Burrows, research metallurgist, Glenn L. Martin Co.; G. F. Bush, research engineer, Eclipse Counterbore Co.

Hallock C. Campbell, associate director, research and engineering, Arcos Corp.; Charles Canitz, Jr., metallurgist, Glenn L. Martin Co.; Gerald Capwell, chemist, Chevrolet-Tonawanda; Charles L. Carlson, student, Carnegie Institute of Technology; Ralph R. Casper, heat treater, Eastman Kodak Co.; Keith A. Charters, salesman, Harrington Tool & Die Co., Ltd.; R. Ernest Christin, chief metallurgist, Columbus Bolt & Forging Co.; Walter H. Clark, metallurgist, LeRoi Co., Cleveland Division; George A. Connelly, heat treater, Canadian Industries, Ltd.; Joseph W. Conway, metallurgist, Crucible Steel Co. of America.

Gerard Davidse, metallurgist; Francisco José Nóbreza de Lima, director, F. Nóbreza de Lima, Lda.; Gerrit De Vries, metallurgist, U. S. Naval Proving Ground; Paul E. Dillberg, production engineer, E. Horton & Son Co.; Ervin A. Domzal, metallurgical department, Hoover Ball & Bearing Co.; R. M. Donaho, Jr., chief chemist, Hughes Tool Co.; Harold A. Dorfman, powder metallurgist, NEPA Division, Fairchild Engine & Aircraft Co.

Morton W. Finch, metallurgist, Rochester Products Division of General Motors; Edward K. Fisher, metallurgical department, Carpenter Steel Co.; James L. Foster, metallurgist, Wheel & Brake Div. Goodyear Aircraft Corp.

C. W. Garrett, development metallurgist, Rod & Wire Div., Jones & Laughlin Steel Corp.; Russell K. Grant, heat treater, General American Transportation Co.

Alfred C. Harris, metallurgist, Kraeuter & Co., Inc.; Louis W. Hille, instructor—machine shop, Philadelphia School District; David W. Hitchcock, district manager, Heatbath Corp.; C. C. Hoffman, metallurgist, Timken Roller Bearing Co.; E. W. Husemann, metallurgist, Copperweld Steel Co.

H. Richard Irwin, metallurgical engineer, Babcock & Wilcox Tube Co.

Arthur J. King, chief draftsman, Coulter Copper & Brass Co.; David L. Kistler, metallurgist; Anthony Klinshaw, hammerman, Worthington Pump & Machinery Corp.; Raymond B. Koehler, materials engineer, Department of the Army, Office of Chief of Ordnance; A. S. Kos, chief engineer, Globe Stamping Div., Hupp Corp.

R. H. Lambert, commander, Navy Department, Bureau of Ships; Bert R. Lanker, chief metallurgist, Farrell-Cheek Steel Co.; P. Leckie-Ewing, metallurgist, Butterfield Division, Union Twist Drill Co.; John C. Lehmann, heat treat tool expert, Kaiser-Frazer Corp.; Walter B. Levy, metallurgist, National Supply Co.; J. E. Lindsay, research engineer, National Radiator Co., John J. Linnehan, service engineer, Linde Air Products Co.; Robert St. Clair Low, powder metallurgist.

Martin S. Maier, physicist, Eastman Kodak Co. (Naval Ordnance Div.); Gordon B. Mannweiler, research engineer, Eastern Malleable Iron Co.; John M. Marchi, metallurgist, Permanente Metals Co.; James H. Marshall, metallurgist, Seeger Refrigerator Co.; John J. McCarthy, instructor, Rensselaer Polytechnic Institute; John K. McIver, metallurgist, Commercial Controls Corp.; A. H. McMahan, subforeman, Hughes Tool Co.; Paul Methé, student, Rensselaer Polytechnic Institute; Donald K. Miller, heat treat foreman, Weirton Steel Co.; Frank W. Miller, assistant plant engineer, Detroit Steel Products Co.; John D. Morris, Equipment Inspector, Lago Oil and Transport Co.; Carl H. Mull, toolmaker, Gleason Works.

F. S. Nussbaum, metallurgical department, National Malleable & Steel Castings Co.

Alfred Pasler, heat treater, Alfred Hofmann & Co.; James R. Patterson, assistant superintendent, Cook Heat Treating Corp.; David W. Pettigrew, Jr., research engineer, Aluminum Research Laboratories; G. W. Place, metallurgical engineer, American Bureau of Shipping; Norbert F. Polakowski, metallurgical supervisor, U. S. Reduction Co.

Harry Quante, tool hardener, Carter Carburetor Co.

R. H. Raymond, sales engineer, Eagle Metals Co.; Leon F. Ross, metallurgical engineer trainee, Mesta Machine Co.

George J. Salvaggio, research engineer, Jones & Laughlin Steel Corp.; S. L. Scheier, superintendent, Columbus Bolt & Forging Co.; Richard D. Schoch, sales engineer, Ladish Co.; A. M. Shrager, teacher, Brooklyn Technical High School; G. H. Silver, metallurgist, Monarch Machine Tool Co.; A. P. Simpson, owner, Simpson Motor; Albert J. Smith, metallurgical engineer, McKay Co.; Charles L. Smith, chemical engineer, Miller Co.; Lester F. Spencer, chief metallurgist, Landers Frary & Clark.

E. S. Taylor, sales engineer, Pacific Steel Casting Co.; R. C. A. Thurston, metallurgical engineer, Bureau of Mines, Canada; Donald A. Trepany, metallurgist, Chevrolet Forge.

Greswold Van Dyke, metallurgist, H. & B. American Machine Co.; Robert M. Van Hoy, mechanical engineer, Mead Johnson & Co.

John C. Wagner, metallurgist, Indianapolis Naval Ordnance Plant; L. E. Wagner, engineer of utilization, Providence Gas Co.; Carl Werth, metallographer, Atlantic Steel Company; James H. Wilson, engineer, Naval Ordnance Test Station; William Wilson, Jr., research metallurgist, Armour Research Foundation; V. W. Wiskochil, metallurgist, Illinois Watch Case Co.; Everett A. Woelfel, plant chemist, Westclox Division, General Time Corp.

Peter E. Young, chemical engineer, Briggs Mfg. Co.

Chris P. Zillich, assistant metallurgist, American Forge Div., American Brake Shoe Co.

Alloys for High-Temperature Service Reviewed by Rutherford at Philadelphia

Reported by Howard J. Godfrey
John A. Roebling's Sons Co.

"Alloys for High-Temperature Service" were reviewed by John J. B. Rutherford, research metallurgist of the Babcock & Wilcox Tube Co., at the April meeting of the Philadelphia Chapter A.S.M.

Chromium alloys, he said, are required above 1000° F., but the addition of nickel to chromium alloys does not improve their high-temperature properties. The addition of 4% of silicon, however, offered good resistance to scaling during laboratory tests in a temperature range of 1200 to 1500° F.

A 25% chromium, 12% nickel steel used in an oil cracking unit was found to be subject to corrosion caused by the presence of vanadium pentoxide in a particular crude oil.

The speaker illustrated by slides the effect of temperature on the microstructure of plain carbon steels, 18-8 stainless steels and high chromium steels, and presented data on short-time tensile tests, creep tests,

John J. B. Rutherford

time-to-fracture, high-temperature fatigue and impact tests. The fatigue test at high temperature is dependent on the speed of testing, he pointed out.

Comparing the heat conductivity of various plain carbon and alloy steels, Mr. Rutherford presented data indicating that although there is a wide divergence in these properties at low temperatures, at high temperatures the conductivities are nearly the same. The oxide film formed at high temperatures also affects the heat conductivity.

Following the dinner which preceded the technical meeting, a motion picture on "The Melting and Refining of Modern Steel" was shown through the courtesy of Allegheny Ludlum Steel Corp.

North Texas Has Barbecue

Reported by Arthur C. Willis

The annual meeting of the North Texas Chapter A.S.M. was held at the Earnest Allen Ranch, near Ft. Worth, on May 26. A barbecue dinner (prepared by Leon Sanders) was served ranch-style at 7:45 p.m., and election of officers was then held.

Reports of the retiring officers were presented, and plans for the coming year were described by the new leaders. The business meeting was then adjourned, and two travel films were shown.

Detroit Honors More Than 50 Old-Timers Austin Describes Research on Carbides

Reported by H. H. Benninger
Peninsular Steel Co.

The deep and abiding interest of members in their society was exemplified at the May dinner meeting of the Detroit Chapter A.S.M. Appropriately designated as "Old-Timer's Night", the evening was dedicated to members who have maintained their membership for 25 years or more.

The humble beginning as the "Steel Treaters" back in 1913 gave little reason to envisage that in 36 years, more than 50 members would be honored by such an evening. Appropriate framed certificates were awarded each old-timer by O. W. McMullan.

The entertainment for the evening was provided by an old-timer of a different type. Bob Hall, extemporaneous speaker and comedian of international fame, made rhymes about the unpublished (but interesting) activities of some of the young and old alike.

The technical lecture was given by James B. Austin, director of research of the United States Steel Corp. His discussion covered some of his recent work on the occurrence of carbides and nitrides in steel. Under certain conditions, he said, metals other than iron can actually replace the iron in iron carbide. Similar observations have been made by others in regard to the ability of carbon to replace nitrogen to a limited extent in a metallic nitride.

James B. Austin

Pittsburgh Inaugurates Carnegie Lecture

Scene at the Speakers' Table When Pittsburgh Chapter Heard Its First Annual Andrew Carnegie Lecture on May 12. Left to right are S. Marshall, research associate, Carnegie-Illinois Steel Corp.; John Chipman of M. I. T., the speaker; T. W. Merrill, chapter chairman; H. W. Walker, retiring secretary; R. F. Mehl, Carnegie Institute of Technology; G. A. Roberts of Vanadium-Alloys Steel Co., chairman-elect; and M. W. Lightner, manager, research and development division, Carnegie-Illinois Steel Corp.

Reported by Carl T. Haller, Jr.
International Nickel Co.

One of the most eventful meetings of the 1948-49 season was held by the Pittsburgh Chapter on May 12 when John Chipman inaugurated the first Andrew Carnegie annual lecture by speaking on "Another Look at Deoxidation." Dr. Chipman, a past national trustee of A.S.M., heads the department of metallurgy at Massachusetts Institute of Technology.

He explained the concept of activity as used in the physical chemistry of deoxidation of steel and the relative efficiency of the common elements. He gave a preview of certain work now being completed in his laboratory which will be presented soon. The lecture will be published in August *Metal Progress*.

THIRTY YEARS AGO

After a short life as independent organizations, the Steel Treating Research Society and the American Steel Treaters Society merged in 1920 to form the present American Society for Metals. The early issues of the official publications of these two societies (1917-1920) are filled with nostalgic and historical associations.—Ed.

—30—

The employment Service Bureau first appears in the *Journal* pages in Jan. 1919. This service has continued uninterruptedly ever since, maintaining a steady popularity among A.S.M. members.

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"Failure of the Carbonizing Process" is the prophetic (?) title of a lengthy article. This author predicts the trend away from carbonized steels and toward use of alloy steels for automobile parts. Such a trend, he says, "would reduce the heat treating departments to only those furnaces needed to heat work to the hardening temperature. These gears, being made of an air hardening steel, only have to be heated to the correct temperature and then pulled out of the furnace and thrown on the floor, or they might be handled on trays. At that, the hardening temperature does not have to be held within as narrow a range as do the carbon steels." How simple, in the good old days!

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Likewise, "Faults of the Carbonizing Process and Their Cure" is the title of an article based on a paper read before the Steel Treating Research Society of Detroit. In this article the word "carburizing" crops up here and there, without any attempt, however, to define it or distinguish its meaning from that of "carbonizing".

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A full-page ad sings the praises of "Woodside's Rapid Carbonizer" manufactured by Park Chemical Co.

—30—

The July 1918 issue of the *Proceedings* reported a circulation of 1500 (present circulation of A.S.M. publications, circa 22,000).

—30—

SIR ROBERT HADFIELD of London (later an honorary member and now deceased) sends greetings to the society and reports on the adoption of the 48-hr. week in Britain. He also contributes an analysis of specimens taken from the famous Iron Pillar at Delhi, India.

Alex Caswell Dies; 26-Year Secretary For N.W. Chapter

Alexis Caswell, secretary-treasurer of the North West Chapter from the time of its organization in 1919 until his retirement from business in 1947, died at his home in Minneapolis on June 3.

A. Caswell

Mr. Caswell devoted 40 years to civic work and the industrial development of Minneapolis. In 1909 he became secretary of the Publicity Club, and when that organization joined the newly organized Minneapolis Civic & Commerce Association in 1911, Mr. Caswell served as its industrial secretary until 1919.

He then became secretary and business manager of the Manufacturers' Association of Minneapolis, Inc., which sponsored a number of affiliated organizations—among them the North West Chapter of A.S.M.—and Mr. Caswell served as secretary-treasurer of each. Mr. Caswell gave untiringly of his help and inspiration to the various groups and earned their unanimous characterization as a "grand gentleman".

In addition to his other civic work he served on various boards and committees during both world wars.

Mr. Caswell was born in Providence, R. I., in 1868, and attended Brown University. When his father died in 1887 he came west, first living in Milwaukee, and moving to Minneapolis in 1895.

C. T. EVANS

Charles Tyndale Evans, a vice-president and director of the Universal-Cyclops Steel Corp., died May 13 following a heart attack.

Mr. Evans, who was 76, retired as general manager of the corporation's Cyclops division in 1946, but continued in an active advisory capacity, going to his office nearly every day he was in Titusville.

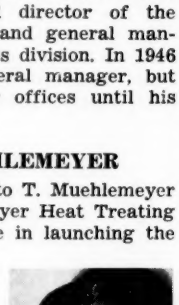
He was born in Chester County, Pa., and put himself through Dickinson College by his own efforts, winning several scholarships, and majoring in science. He then attended University of Pennsylvania and Harvard University, receiving his Master of Science degree at the latter institution. After teaching for one year at a preparatory school, he joined the faculty of the Hill School at Pottstown, Pa., as science teacher. He ultimately became head of the science department and dean of the school.

From time to time officials of the Cyclops Steel Co. sought his advice on some problems which were troubling them, and in 1918 they asked him to join their organization. As chief metallurgist, Mr. Evans did development work on stainless steels for which he was awarded several patents. Under his supervision, in 1919, was made the first commercial heat of nickel-chromium stainless steel in the United States.

When Cyclops met financial difficulties in 1925, Mr. Evans became trustee in receivership, and was instrumental in seeing that Universal Steel Co. of Bridgeville obtained a controlling interest. In 1935 the Universal-Cyclops Steel Corp. was formed, and Mr. Evans was named vice-president and director of the new organization and general manager of the Cyclops division. In 1946 he retired as general manager, but retained his other offices until his death.

O. T. MUEHLEMEYER

The death of Otto T. Muehlemeyer of O. T. Muehlemeyer Heat Treating Co. recalls his role in launching the Rockford Chapter A.S.M. back in 1921. Mr. Muehlemeyer, then with the Barber-Colman Co., took a leading role in establishing the new chapter and served as its chairman for two years.



O. T. Muehlemeyer

German-born and educated in the finest technical traditions of the old Germany, Otto Muehlemeycr came to Rockford in 1909, and took charge of the heat treating department and chemical laboratories for Barber-Coleman Co. He formed his own heat treating company in 1925.

Technology Enters Foundry Sand Control

C. H. Lorig, (Left), Who Spoke on Modern Foundry Practice Before the Penn State Chapter, and R. W. Lindsay (Right), Associate Professor of Metallurgy at Penn State

Reported by F. R. Lorenz, Jr.
Pennsylvania State College

New methods and techniques of gravity sand casting are eliminating some of the troubles of this old craft, Clarence H. Lorig, assistant director of Battelle Memorial Institute, told the Penn State chapter at its April meeting. Dr. Lorig's subject was "Modern Foundry Practice".

Technology is creeping into the all-important control of sand mixtures, he said, and there is still a great need for a study of the dynamic flow of the molten metal through the sand molds. He used specific examples to show just how some of the time-honored sprue, gate, and riser systems were wrong in what they were supposed to accomplish as revealed by dynamic flow studies. Special precautions must be taken to avoid gas effects in castings, and synthetic sand mixtures are becoming more widely used.

In closing, he pointed out that many practices used today were developed years ago. Present-day science is a bit behind in explaining the reasons for some of these common practices, but, bit by bit, it is infiltrating into the domain of the old master craftsmen of the foundry.

File of Key Engineering Personnel to Be Collected

To provide source material for a who's who in engineering research, development and other scientific operations for use by the National Military Establishment, the Engineers Joint Council, acting through the American Society of Mechanical Engineers, has accepted the task of providing the Office of Naval Research with the names, addresses, ages, and details of professional and scientific qualifications of 100,000 key engineers in all branches of American engineering.

The source file of key engineering personnel thus obtained will provide a valuable tool for solving a variety of technical and personnel problems. The file will also point up weak spots which should be strengthened by education, training and other means. As a national asset, the body of facts will be available to industrial, educational and professional society groups.

A four-page questionnaire will soon be mailed to 100,000 engineers holding the grade of member or higher in 18 national professional engineering societies. The returns will be collected by the A.S.M.E. and turned over to the Office of Naval Research of the National Military Establishment for Classification. The questionnaire will provide the key to opportunity for professional and patriotic service, and engineers selected to receive it are urged to give it serious attention and to answer all questions fully.

Knerr Honored for 25 Years' Service as Director of Night Course

Horace C. Knerr, consulting metallurgist of Philadelphia, recently resigned as director of the Evening Metallurgy Course at Temple University, conducted in cooperation with the Philadelphia Chapter A.S.M. He has been elected director emeritus of the course.

H. C. Knerr

At a dinner of the Alumni Association of the course, Mr. Knerr was presented a plaque in recognition of his services, reading as follows: "Presented by the Philadelphia Chapter, American Society for Metals, to Horace C. Knerr in recognition of his contribution to the A.S.M. Evening Metallurgy Course at Temple University, and in grateful acknowledgment of his faithful and wise conduct of the course for 25 years."

Philadelphia Chapter officials believe that this course has a longer continuous record of service than any other A.S.M. cooperative course. There are now more than 2500 alumni of the course, and it has just completed one of its most successful years.

Walter Kinderman, research engineer, Yarnall-Waring Co., has taken over the direction of the course, and Mr. Knerr will continue on the lecture staff.

Tin Research Institute Offers Technical Services

The Tin Research Institute of London, England, has announced the formation of the Tin Research Institute, Inc., an American corporation devoted to providing free technical service to consumers of tin in the United States. The office of the new corporation, at 492 West Sixth Ave., Columbus 1, Ohio, will handle all inquiries or requests for technical service, while a sponsorship will be maintained at Battelle Memorial Institute to handle new researches.

Technical experts are available for consultation and practical assistance either at the Institute or at the consumers' plant. A wide range of publications covering every important use of tin is available free of charge. Inquiries are invited.

Robert J. Nekervis has been appointed supervisor of metallurgical development and Robert M. MacIntosh has been appointed supervisor of chemical development in the new corporation. Both have been associated with Battelle Memorial Institute for the past eight years.

View Mass Production of Aluminum Lighting Fixtures

Reported by **E. R. Freeman**
Research Metallurgist
Permanente Metals Corp.

Light metals and their application in lighting were discussed by Edw. Caffero, chief engineer for the Columbia Electric & Mfg. Co. of Spokane.

Speaking at the May dinner meeting of the Inland Empire Chapter A.S.M., Mr. Caffero stressed the use of aluminum for lightness, corrosion resistance, and ease of workability. Columbia Electric uses aluminum for lighting fixtures because it gives high reflectivity without the use of paint.

The evening was concluded by a tour of the Columbia Electric & Mfg. Co., where members and guests of the chapter saw aluminum used in mass production in the manufacture of fluorescent lighting fixtures.

Syracuse Member Dies

Walter A. Bolton, long a member of the Syracuse Chapter A.S.M., died on May 2 after a short illness. Mr. Bolton, who had lived in Syracuse for 30 years, was president of the R & B Rock Bit Co. and Syracuse representative of Wyckoff Steel Co.

If Alloys Could Talk...

If alloys could talk—could correctly identify themselves, state their hardenability, their mechanical properties and their best working temperatures—the tasks of specifying, buying and heat treating would be greatly simplified and virtually mistake-proof.

Although we stock no talking steels, we put Ryerson alloys through conclusive hardenability tests—literally make every heat in our stocks reveal every essential fact about itself. Then we carefully record the information on a Ryerson Alloy Certificate delivered with the steel.

Because we make our alloys tell all, you're able to specify and buy the safe way — on the basis of hardenability. Because we send a Ryerson Alloy Certificate with every shipment, your heat treaters are provided with the information they need to do a quick, accurate job.

Large stocks of Ryerson certified alloys are in stock for immediate delivery. When you want quick shipment of any alloy requirement call your nearest Ryerson plant.

PRINCIPAL PRODUCTS

BARS—Carbon & alloy, hot rolled & cold finished

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MACHINERY & TOOLS—For metal working

RYERSON STEEL

Joseph T. Ryerson & Son, Inc. Plants at: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco

Worcester Officers Greet Speakers

Orum R. Kerst (Left) Was Elected Chairman of the Worcester Chapter at the April Meeting. Next to him in order are J. Walter Gulliksen, technical chairman of the meeting; Prof. Carl G. Johnson, the speaker; and Lincoln G. Shaw, re-elected secretary-treasurer of the chapter

Modern Soaking Pits Controlled by Instruments Rather Than Observation

Reported by John A. Rassenfoss

Research Metallurgist, American Steel Foundries

Since so many such units are being replaced at the present time, "Selection of Soaking Pits" proved to be a very interesting and timely topic for the principal address at the April 12th meeting of the Calumet Chapter A.S.M. The speaker, Edw. A. Brown, superintendent of power and fuel division, Gary Works of Carnegie-Illinois Steel Corp., described the salient features of each furnace type and pointed out the advantages or disadvantages of various design features.

According to Mr. Brown, all the standard pits of modern design are excellent equipment and their selection for a particular application is not the choice of a good pit, but rather the selection of the one whose principle is best adapted for particular conditions. Variables to be considered in selecting a suitable soaking pit include transit time, ingot type and size, production rate, weight coverage desired, required accuracy of temperature variation, and alloy steel to be heated.

In contrast with old designs, modern soaking pits are relatively large, fully encased, insulated, equipped with draft and temperature controls, as well as fuel-air proportioning (usually of the recuperator type), provide room for a long heating flame, and depend upon proper instrumentation rather than human judgment.

Tangible advantages result from the use of modern pits as compared with older types. Ingots are heated to the same desired temperature each time (very close to the temperature specified by the metallurgical staff); fuel consumption is approximately 60% and scale loss one-third of that incurred in an older pit; production is 10% higher per pit building unit area (but not per unit pit area); and quality of heating is better as judged by temperature uniformity within the ingot.

With any of the six general types of modern pits, withdrawal of ingots for rolling is judged simply by consulting the control instruments rather than by the visual observation of an experienced operator. Successful use of instrument control, Mr. Brown emphasized, is dependent on its maintenance and upon the correct placement of the control thermocouples. In general, best practice places the pit control thermocouple at a point where the highest ingot temperature will be obtained. In this respect it is important that ingots be carefully positioned in the pit according to an established pattern and not crowded together. Failure to observe this precaution will result in nonuniform heating and an incorrect temperature reading.

New Company Formed

Nat Levin, formerly development engineer of the Induction Heating Corp., along with John H. Garger and James P. Moran, formerly assistant sales manager and research engineer, respectively, of the same organization, have formed the High Freqency Foundry Sales Corp., with offices at 76 Beaver St., New York 5. The company will act as sales representatives for the Thermex Division of the Girdler Corp., handling high-frequency foundry core baking equipment and allied lines.

Structural Parts Are Important Field for Powder Metallurgy

Reported by C. Weston Russell

Wyman-Gordon Co.

The various steps in the manufacture of articles from metal powders were outlined by Carl G. Johnson, associate professor of mechanical engineering, Worcester Polytechnic Institute, at the April meeting of the Worcester Chapter A.S.M. The field of application which is proving of great present interest, he said, is in the manufacture of structural parts.

Powder metallurgy is the technique or practice by which metals or alloys are produced in the finely divided state or powder form. This powder metal is then fabricated into manufactured parts without use of the standard methods of casting or forging.

The fabrication process consists of cold pressing the metal powders, forming a cold weld with pressures up to 50 tons per sq. in., and then heating this pressed form to a temperature under the melting point which will develop the maximum increase in strength. This heating process is called sintering.

The powders are prepared for fabrication in a mechanical blender or mixer. Since it is impossible to lubricate the dies and tools used in fabrication, the lubricant is added to the metal powders. The usual lubricant is zinc stearate in amounts varying from 0.50 to 1.50%.

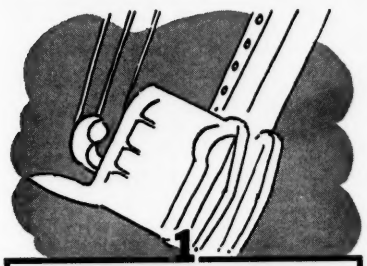
Some of the more important variables affecting the fabrication of structural parts include design of both parts and tools, tool materials, presses, sintering temperatures, and properties of fabricated parts. Density specifications are of the highest importance from the viewpoint of both the fabricator and user.

Although all the structural parts manufactured by powder metallurgy can be produced by casting and forging methods, many millions of parts have been made by this new method because of special properties and more economical production. Parts that have been successfully fabricated by the Presmet Corp. of Worcester, pioneer pressed metal parts manufacturers, include lock hardware, small gears, cams, levers, pawls, bushings and others. The industry is in its infancy, Professor Johnson said.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
Ralph H. Hopp, Librarian *W. W. Howell, Technical Abstractor*



ORE BENEFICIATION and RESERVES

1A—General

1A-33 Industrial Minerals of Colorado. George O. Argall, Jr. *Quarterly of the Colorado School of Mines,* v. 44, Apr. 1949, 477 pages.

Entire issue is devoted to an extensive survey. Each material is treated under properties, uses, occurrences, production, mining and concentration, and marketing (including prices and freight rates).

1A-34. How You Can Predict Product Screen Analyses. E. J. Klovers. *Engineering and Mining Journal,* v. 150, June 1949, p. 80-81.

How estimated screen analyses of the products to be expected from a given crusher or grinding mill can be made with considerable accuracy when a screen analysis of the same material is available at a size not too far removed from that of the desired product.

1A-35. Untersuchungen uber die gunstigste Wichte von Mahltruben. (Investigations of the Optimum Specific Gravity of Ball Mill Sludge.) Gunther Flugge. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Feb. 1949, p. 43-47.

The best grinding effect is obtained with a sludge that has a considerably higher specific gravity than was previously assumed. Two formulas for determining the optimum specific weight of the sludge of any given ore.

1A-36. (Book) **Ore Genesis.** Ed. 1. John Stafford Brown. 204 pages. 1948. Hopewell Press, Hopewell, N. J.

Field of physical chemistry as applied to ore-forming substances. A new hypothesis as to the origin of ore deposits which the author believes fulfills requirements of an adequate theory better than currently accepted explanations. 139 ref.

1B—Ferrous

1B-38. Agglomeration of Taconite Concentrate. Worm Lund. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 1-3.

Filter briquetting process employed in Norway before the war, this process having superseded the earlier sintering plant. Early tests with a pelletizing process.

1B-39. Iron Ore Concentration at Sydvaranger, Norway. J. Kraft Johanssen. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 4-11.

Dressing, crushing, and concentrating magnetite iron ore mined at Aktieselskabet Sydvaranger, and composition of the ore. The method of concentrating by magnetic separation and degree to which the concentrate is dewatered. The old plant was destroyed during the war. Proposals for the new plant.

1B-40. Die Aufbereitung als Grundlage fur die Verhuttung armer saurer Erze. (Beneficiation as a Preliminary to Smelting Low-Grade Acid Ores.) Carl Paul Debuch. *Stahl und Eisen,* v. 66-67, June 19, 1947, p. 205-212.

The supply and mining of ores in the Salzgitter area and the methods and equipment used in their beneficiation.

1B-41. Eagle Mountain Iron Ore Reserves Expected to Meet Fontana's Requirements for 40 Years. *Steel,* v. 124, May 30, 1949, p. 60-61.

Reserves which supply Kaiser Co., Fontana, Calif.

1B-42. Iron Ore Conditioning and Sintering. Francis H. Crockard. *Iron and Steel Engineer,* v. 26, May 1949, p. 106, 108. A condensation.

1B-43. Iron Resources of Wisconsin. E. F. Bean. *Skillings' Mining Review,* v. 38, June 4, 1949, p. 1, 4, 11.

1B-44. Average Analyses of 1948 Shipments of Lake Superior Iron Ore. *Skillings' Mining Review,* v. 38, June 11, 1949, p. 1-2.

For the various ranges.

1B-45. Sintering to Raise Iron Ore Output. *Engineering and Mining Journal,* v. 150, June 1949, p. 59.

Methods now in use at plant of Siderurgica Belgo-Mineira, Brazil.

1B-46. Britain Gets Half Its Iron From Its Lean Ores. David D. Howat. *Engineering and Mining Journal,* v. 150, June 1949, p. 66-69.

Lean-ore smelting practice and preparation in Britain. Crushing, screening, drying, agglomeration, and charging practice have been developed so that the industry can utilize ores containing only 18-25% Fe economically.

1B-47. Sintering Characteristics of Minus Sixty-Five and Twenty Mesh Magnetite. Alan Stanley and Joseph C. Mead. *Mining Engineering,* v. 1, sec. 3, June 1949 (*Mining Transactions,* v. 184), p. 181-186.

Work done to improve the quality of the ilmenite concentrate produced from a titaniferous iron ore, and to reduce the amount of TiO_2 lost in tailings and magnetite product. The crude ore is ground to —65 mesh, and concentrated by magnetic separation of magnetite and flotation of ilmenite. Details of work using a Greenawalt pilot sintering plant. Factors investigated were: return fines, coal, moisture, slaked lime and miscellaneous reagents, oxidation, limestone, sawdust, pellets, "dust", and mixing time. Production runs were made.

1B-48. Humphreys Spiral Concentration on Mesabi Range Ores. Whitman E. Brown and Louis J. Erck. *Mining Engineering,* v. 1, sec. 3, June 1949 (*Mining Transactions,* v. 184), p. 187-193.

Installation of Cleveland-Cliffs Iron Co. at its Hill-Trumbull plant on the Mesabi Range. Flow diagrams and operating data.

1B-49. Nove myslenky o nejstarsim pravekem vyskytu zeleza a zelezarstvi ve stredni Evrope. (New Data Concerning Deposits of Iron Ore in Central Europe.) Josef Skutil. *Hutnicke Listy,* v. 3, Dec. 1948, p. 366-370.

1C—Nonferrous

1C-40. Akron Unit Mills Complex Ore. K. K. Hood. *Mining Congress Journal,* v. 35, May 1949, p. 41-43.

Deposits and methods of treatment. Ore varies widely in grade and physical qualities.

1C-41. Trennung von Grobkorn in Schwertrube bei der Aufbereitung von Ramsbecker Bleizinkerz. (The Separation of Coarse Grains in Heavy Sludge in the Dressing of Ramsbecker Lead-Tin Ore.) Gunther Salzmann. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, June 1948, p. 72-79.

Experiments were made to find ways of replacing handpicking of ores by a heavy-media separation method.

1C-42. Uber die Möglichkeit der Ausbringenssteigerung einer Erzaufbereitung durch Verlagerung der Vermahlung ins Gröbere. (The Possibility of Increasing the Yield of an Ore Dressing Plant by Changing to a Coarser Grind.) F. Zrenner. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 163-170.

The system, yield, and consumption of reagents of an existing copper flotation plant (daily output: 2250 tons). How improved yields and concentrate qualities were achieved.

1C-43. Investigation of Concentration Sections at the Central Mill of the Eagle-Picher Mining & Smelting Co., Cardin, Okla. H. Kenworthy, W. A. Calhoun, and M. M. Fine. *U. S. Bu-*

reau of Mines, Report of Investigations 4511, May 1949, 37 pages.

Sink-float, ferrosilicon, flotation-tailing, and jetting investigations.

1C-44. Uranium Resources. *Nucleonics,* v. 4, May 1949, p. 23-28. Based on address by J. K. Gustafson.

Occurrence in nature, supply, and U. S. uranium program.

1C-45. The Vanadium-Bearing Solid Bitumens of the Argentine. F. F. Kett. *Vancoram Review,* v. 6, no. 1, (1948), p. 3-6, 18-21.

Investigation made by the Vanadium Corp. of America in Argentina gives location, extent, and analyses of deposits.

1C-46. (Book) **Tungsten Mineralization in the United States.** Paul F. Kerr. 241 pages. 1946. Geological Society of America, 419 West 117th St., New York, N. Y.

Occurrences from the standpoint of origin. Localities on record prior to January 1942 and more important discoveries reported since. 15-page bibliography.

2 SMELTING, REDUCTION and REFINING

2A—General

2A-5. The Soderberg Electrode System. Herman Christiansen, Jr., and B. Ydstie. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 98-100.

Method of manufacture of the electrode paste. The purest materials are required for electrodes for use in steel and aluminum furnaces. In smelting furnaces, the Soderberg electrode system is said to have a number of important advantages over other types of electrode. Extensive tests are being carried out to perfect the performance of the electrodes in steel furnaces. A new type of electrode system, employing vertical contact stubs, has simplified the operation of Al furnaces, and has made possible a high degree of mechanization. Furnaces using this system are completely closed. Fluorine and SO_2 are removed from the furnace gases and their adverse effects are entirely eliminated.

2A-6. Otazka okyslicovani kovu. (The Problem of the Oxidation of Metals.) A. Krupkowski. *Hutnicke Listy,* v. 3, Dec. 1948, p. 357-361.

Derives an equation for calculation of the free energy of chemical reactions. A table compiled with the aid of this equation enables one to determine the affinity of individual metals for oxygen and thus the comparative ability to remove impurities from molten metals at temperatures in excess of 1000° C.

2A-7. (Book) **The Chemistry of Process Metallurgy.** 344 pages. Gurney and Jackson, 98 Great Russell St., London, England. (Discussions of the Faraday Society, no. 4, 1948.) 30s.

A symposium held at Ashorne Hill, Warwickshire, England, Sept. 23-25, 1948. Introductory address by Andrew McCance; 26 papers dealing with general principles, metallic solutions, roasting and reduction processes, slags, and refining processes; general discussions. Individual papers were previously abstracted separately from *Faraday Society Transaction,* Preprints, Sept. 1948.

2B—Ferrous

2B-158. Recherches sur les fours a induction a haute fréquence. (Research on the High-Frequency Induction Furnace.) H. G. Haemers and F. M. Bosch. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 367-378; discussion, p. 414-444.

Deals with slag-lining reaction in the above. Elimination of C, Si, and less than 0.02% P can be obtained without difficulty; elimination of 0.05% Mn is easy, further elimination is difficult; elimination of S is easy, provided the slag is heated.

2B-159. New "Turbo-Hearth" Steel Method Combines Bessemer and Open Hearth Processes. *Industrial Heating,* v. 16, May 1949, p. 826, 828.

Basic principles of recently developed method and equipment.

2B-160. Cold Metal Operations and Basic Foundry Practice. *Industrial Heating,* v. 16, May 1949, p. 832, 834, 836, 838, 840.

Summarizes papers and discussion on subject presented at 31st conference of National Open Hearth Steel Committee of AIME, Pittsburgh.

2B-161. A Brief History of Electric Pig-Iron Smelting in Norway. Herman Christiansen, Jr. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 11-12.

Future plans.

2B-162. The Manufacture of Electric Steel in Great Britain. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 57-78.

Data for 30 arc furnaces. Practice in one arc-furnace and in one induction-furnace shop is considered in more detail, and reference is made to the use of arc furnaces in foundries. Processes which have been used for making rimming and balanced mild steel in the electric arc furnace. Among possible future developments, mention is made of the use of oxygen.

2B-163. Operator Know-How Prolongs Electric Furnace Lining Life. John Tjemmes. *American Foundryman,* v. 15, May 1949, p. 73. A condensation.

Recommended procedures; record performance in which a super-duty clay roof lasted for 657 heats.

2B-164. Improving Bessemer Steel Quality for the User. H. A. Dickie. *Sheet Metal Industries,* v. 26, May 1949, p. 956-959, 970.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 2b-161, 1948.

2B-165. Some Notes on the History of Nodular Irons. *Iron Age,* v. 163, May 19, 1949, p. 100-102, 149.

An exchange of correspondence relating to the early history of the development of the nodular (or spherulitic) graphite structure between H. Morrogh, British Cast Iron Research Assn., and Oliver Smalley, president, Meehanite Metal Corp. Priority of development is contested between Meehanite Corp. and BISRA. 18 ref.

2B-166. Adding Oxygen to the Cupola Blast. *Iron Age,* v. 163, May 26, 1949, p. 65.

Running a small pipe no larger than ⅜-in. diam. to the top of each tuyere, each pipe being equipped with a small valve, is suggested as an effective method of making oxygen additions. With an arrangement of this type, the oxygen, being heavier than air, would fall into the blast stream, thus being intermixed. See abstract of article by J. Blakiston, *Foundry Trade Journal,* 2B-131, 1949.

2B-167. Die Entwicklung des basischen Windfrischverfahrens. (The Development of the Basic Converter Process.) III-V. Walter Bading. *Stahl und Eisen,* v. 66-67, June 19, 1947, p. 212-223.

Production of phosphorus double slags; rapid dephosphorization and deoxidizing reactions; production of low-nitrogen steel. Suitability of the basic converter for the large-scale production of special steels.

2B-168. Möglichkeiten zur Beeinflussung der Oxydations-zone des Hochöfens. (Possibilities of Influencing the Oxidation Zone in the Blast Furnace.) *Stahl und Eisen,* v. 66-67, Aug. 14, 1947, p. 277-284.

Results of an experimental study of the oxidation zone in which amount of blast air, blast temperature, and blast angle were systematically varied. The various distributions of O_2 and CO_2 content. Different types of high-pressure nozzles. 16 ref.

2B-169. Eisengewinnung mit hochhaltigem Sauerstoff. (Production of Iron With Highly Concentrated Oxygen.) Robert Durrer. *Stahl und Eisen,* v. 66-67, July 17, 1947, p. 239-241.

Possibility of commercial application.

2B-170. Die Manganausnutzung beim basischen Siemens-Martin-Verfahren. (The Utilization of Manganese in the Basic Openhearth Furnace.) Hans-Joachim Krabiell. *Stahl und Eisen,* v. 66-67, Dec. 4, 1947, p. 420-424.

Investigates, by mathematical methods and by evaluating of a series of melts, the factors that influence the utilization of Mn, including the effect of P in the charge. 13 ref.

2B-171. Oxygen in Iron and Steel Manufacture. L. F. Keeley. *Machinery Lloyd* (Overseas Edition), v. 21, May 21, 1949, p. 77-79.

2B-172. Factors Affecting Surface Quality. L. R. Walker. *Iron and Steel Engineer,* v. 26, May 1949, p. 58. A condensation.

Some of the problems encountered at one steelmaking plant in producing semifinished and finished material to acceptable standards of surface and internal quality. Practical solutions.

2B-173. Developments in Hot-Top Designs. E. W. Pierce. *Iron and Steel Engineer,* v. 26, May 1949, p. 69. A condensation.

Results of extensive experimental work.

2B-174. Some Aspects of Large and Small Blast Furnace Operation. G. P. Burks. *Iron and Steel Engineer,* v. 26, May 1949, p. 98. A condensation.

2B-175. "Turbo-Hearth" Steel Method Combines Benefits of Bessemer and Open Hearth. *Iron and Steel Engineer,* v. 26, May 1949, p. 108-109.

2B-176. Commercial Production of Sponge Iron. P. E. Cavanagh. *Iron Age,* v. 163, June 2, 1949, p. 67-71, 82.

Production and use in steelmaking as a substitute for scrap is shown to be commercially feasible, particularly in the making of quality steels, both in Canada and in the U. S. Test runs conducted in Sweden, employing the Wiberg-So-

derfors process, show excellent performance and high production rates for Canadian Steep Rock ore. Comprehensive operating and cost data, converted to southern Ontario conditions, as well as information relating to sponge-iron end uses.

2B-177. Appraisal of Oxygen in Electric Furnace Practice. J. M. Crockett, *Steel*, v. 124, June 6, 1949, p. 126, 128, 130, 132.

Experiments indicate that there is a definite rate of oxygen injection per ton of charge, above which efficiency lessens. The rate for greatest efficiency appears to be about 100 cu. ft. per min. per ton.

2B-178. Furnace Charging; Present Methods in Open-Hearth Shops. E. L. Diamond and A. M. Frankau. *Iron and Steel*, v. 22, May 12, 1949, p. 246-254; discussion, p. 272-274.

Factors in the performance of existing systems; charging requirements; charger performance limits; supply-system limits; the layout and operation of a stage railway system; and time studies at existing works.

2B-179. O.-H. Charging Rate; The Influence of Heat Transfer. M. W. Thring. *Iron and Steel*, v. 22, May 12, 1949, p. 255-258; discussion, p. 272-274.

Previously abstracted from *Journal of the Iron and Steel Institute*, item 2B-109, 1949.

2B-180. Casting Pit Practice and Ingot Defects. R. N. Duncan. *Journal of the West of Scotland Iron and Steel Institute*, v. 55, 1947-48, p. 119-131; discussion, p. 131-140.

Previously abstracted from *Engineering*, item 2b-151, 1948.

2B-181. Periodic Operation of Electric-Arc Steel Furnaces. (In Russian.) N. V. Okorokov. *Promyshlennaya Energetika* (Industrial Power), v. 6, Jan. 1949, p. 1-4.

Attempts to establish theoretically a relationship between average melt size and dimensions and capacity of the furnace, on the one hand, and effectiveness, number of melts per operating cycle, and electric-power consumption, on the other hand.

2B-182. Neue Betriebserfahrungen bei der Herstellung stickstoffarmen Stahles durch Windfrischen. (New Experiences in the Production of Low-Nitrogen Steel in the Converter.) Walter Bading. *Stahl und Eisen*, v. 69, Mar. 31, 1949, p. 221-223.

Advantages of the oblique-blast converter, its construction, and operation. Results indicate that this converter combines advantages of the standard with those of the side-blast converter. P and N contents of steels refined by this process are less than 0.05%.

2B-183. Karburierung von Siemens-Martin-Ofen durch Gas. (Gas Carburization in Openhearth Furnaces.) Kurt Guthmann. *Stahl und Eisen*, v. 69, Mar. 31, 1949, p. 223-227.

Use of different gases in the production of steel. Proposes use of small gas generators near furnaces for production of carburizing gas to supplement coke-oven gas. Melts thus carburized can be tapped 15-25% hotter than noncarburized melts, resulting in reduction of melting time and higher steel quality. 15 ref.

2B-184. Verhutten mit sauerstoffangereichertem Wind. (Smelting With Oxygen-Enriched Blast.) Heinrich Hellbrugge. *Stahl und Eisen*, v. 69, Apr. 14, 1949, p. 256-258.

Results of tests in a low-stack furnace. The study included high-carbon ferrochromium (28-45% Cr) and silico-chromium (47% Cr and 13% Si). The O_2 content of the blast was about 80%.

2B-185. Zusammengiessen von Thomasstahl und Elektrostahl. (Combining Basic Bessemer and Electric-Furnace Steels by Melting.) Egon Ritter. *Stahl und Eisen*, v. 69, Apr. 14, 1949, p. 258-262.

The combination of electric-furnace steel with an equal quantity of low-phosphorus or low-P and low-N steel increases production of steels equal in quality to electric-furnace or openhearth steels. Melting procedure.

2B-186. Neuere Erkenntnisse uber die Vorgänge im Konverter und ihre Bedeutung fur das Windfrischverfahren. (Recent Information on Converter Reactions and Their Significance.) *Stahl und Eisen*, v. 69, Apr. 28, 1949, p. 308-309.

Proceedings of German conference on the subject. 11 ref.

2B-187. Custo de producao do ferro gusa em forno eletrico do tiop tyslandhole, usando como redutor exclusivamente carvao de madeira. (Cost of Production of Cast Iron in an Electric Furnace of the Tysland-Hole Type Using Charcoal Exclusively as a Reducing Agent.) Ernesto L. Fonseca Costa. *Boletim da Associacao Brasileira de Metais*, v. 5, Jan. 1949, p. 16-26.

Investigated on the basis of actual costs of electric energy in San Paulo. Computed data indicate that, only in case of reduction of electric energy cost by 16.7%, would the production of cast iron under the above conditions be profitable.

2B-188. A influencia de alguns fatores sobre a sinterizacao de minerios de ferro. (Influence of Certain Factors on Sintering of Iron Ores.) Tharcisio D. de Souza Santos. *Boletim da Associacao Brasileira de Metais*, v. 5, Jan. 1949, p. 57-67.

As applied to production of iron in blast furnaces using charcoal as the heating and reduction agent.

2B-189. Kontrola zuzla w zasadowym procesie martenowskim. (Slag Control in the Basic Open Hearth Furnace Process.) A. Ludkiewicz, E. Bucko, and S. Pniak. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 13-25.

Purposes and methods. On the basis of results obtained by observing 20 heats of steel in a 30-ton basic openhearth furnace, slag patterns were established for CaO-SiO_2 ratios of 1.2-4.79 for various contents of FeO. Control by means of slag pancakes offers no difficulties.

2B-190. (Book) **Les Laitiers Métallurgiques et Leurs Réactions.** (Metallurgical Slags and Their Reactions.) E. Eyt. 94 pages. 1949. Dunod, 92 rue Bonaparte, Paris 6, France. 960 fr.

Chemical constitution of slags and of slag-metal reactions. The information presented is believed to be of value to glass and ceramics technologists and cement makers, as well as to metallurgists and steelmakers.

2C—Nonferrous

2C-26. Untersuchungen uber die Aluminothermie des Mangans. (Research on the Aluminothermic Production of Manganese.) K. Giesen and W. Dautzenberg. *Archiv fur Metallkunde*, v. 2, Feb. 1948, p. 49-53.

In this process for reduction of Mn ore, the oxide stage has a great effect on the yield and purity of the resulting Mn. The effects of various grain-size and furnace-size factors.

2C-27. Einige grundlegende Gleichgewichte bei der Bildung metallurgischer Speisen. (Some Basic Equilibria in the Formation of Metallurgical Charges.) Hermann Kleinheisterkamp. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 1, June 1948, p. 65-72.

Experiments were undertaken to clarify the status of some previously uninvestigated systems of importance in blast-furnace smelting, with emphasis on sulfide ores of Cu or Cu-Pb containing Fe, Ni, Co, As, Sb, or Sn, or various combinations of these elements.

2C-28. Versuche zur Herstellung von Feinindium 99.99% aus Rohindium. (Experiments on the Production of Refined Indium (99.99%) From Crude Indium.) Reinhard Kleinert and Hermann Dreyer. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 1, June 1948, p. 79-83.

Examines published methods and develops a more successful and relatively simple one in which the indium is extracted from solution by a three-step displacement process.

2C-29. Die Antimonanlage der Herzog Juliushutte. (The Antimony Plant of the Herzog Julius Mine.) Otto-Hermann Schutze. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 1, July 1948, p. 103-109.

Plant and its operation. Metallurgy of antimony and methods of extracting and refining it.

2C-30. Inverting Standard Furnace Increases Smelter Profits. *Engineering and Mining Journal*, v. 150, June 1949, p. 70-71.

How inversion of the bosh of the blast furnace has enabled a Pennsylvania operator handling copper scrap to almost triple capacity and greatly improve smelting practice. Coke consumption has been decreased from 25 to 10% of the charge.

2C-31. Analyse thermodynamique de la reaction d'equilibre $6Cu + SO_2 \rightleftarrows 2Cu_2O + Cu_2S$. (Thermodynamic Analysis of the Equilibrium Reaction $6Cu + SO_2 \rightleftarrows 2Cu_2O + Cu_2S$.) Henry Lepp. *Revue de Metallurgie*, v. 46, Mar. 1949, p. 155-159.

The interaction of Cu_2O and Cu_2S follows the above equation over a very wide temperature range; and absorption of SO_2 by liquid copper is a purely chemical reaction according to the above formula.

2D—Light Metals

2D-15. Electrode Reactions in the Aluminium Reduction Cell. T. G. Pearson and J. Waddington. "Electrode Processes", *(Discussions of the Faraday Society*, No. 1, 1947) p. 307-320; discussion, p. 325-328.

Characteristic features when operating in the normal condition. Much of the experimental work and most of the theoretical arguments have already been published; however, new information on the constitution of molten cryolite electrolytes and on the conductivity of electrolytes containing calcium fluoride, and new work on the cause of CO formation in the anode gases. Also correlates the scattered literature data. 37 ref.

2D-16. Flussmittel in der Aluminiumgiesserei. (Fluxes for the Melting of Aluminum.) *Metall*, July 1948, p. 230-232.

Fluxes, according to their function, are of two general types, namely, oxide-dissolving fluxes used during the melting operation and for removal of slag; and fluxes used for removing gases and oxides shortly before the melt is cast.

2D-17. Resultats experimentaux et reflexions au sujet de l'emploi du procede Pfeiffer dans le controle du degazage des alliages legers dan les fours industriels de fusion. (Experimental Results and Comments Concerning the Application of Pfeiffer's Method for the Control of Degasification of Light Alloys in Industrial Melting Furnaces.) Jacques Pothelet. *Revue de Metallurgie,* v. 46, Mar. 1949, p. 160-162.

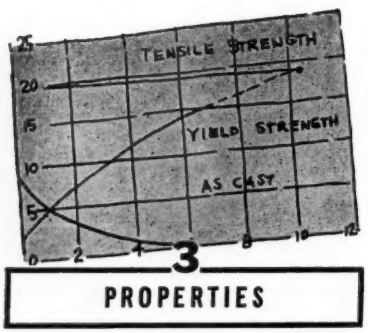
Critically analyzes method for determination of the gas content in light alloys. Concludes that it cannot be utilized for control of degasification of individual light-alloy melts. However, data obtained by this method may be used for improvement of the quality of products as a result of more thorough investigation of conditions of the melting process and factors which may cause gas inclusions.

2D-18. Uber die Herstellung metallurgischer Tonerde. (The Production of Metallurgical Alumina.) Part II. Friedrich Klema. *Mitteilungen des Chemischen Forschungsinstitutes der Industrie Osterreichs,* v. 3, Apr. 1949, p. 24-29.

Several new methods of extracting Al_2O_3 from low-grade and, especially, SiO_2-rich bauxites. 18 ref.

For additional annotations indexed in other sections, see:

1B-46; 3B-119; 15-35-36-40-42; 19C-15; 22B-202



3 PROPERTIES

3A—General

3A-112. The Interpretation of the Theory of Superconductivity. M. von Laue. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 90-93; discussion, p. 127-128

A theoretical discussion.

3A-113. Size Effects in Superconductivity. D. Shoenberg. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 93-101; discussion, p. 127-128.

Three different parameters, each having the dimensions of a small length, are involved in superconductivity; whenever the specimen size becomes comparable to one of these lengths, characteristic departures from the properties of the bulk metal occur. Present state of knowledge about these effects and experimental work on them in the Mond Laboratory, Cambridge. 15 ref.

3A-114. Nuclear Ferromagnetism. H. Fröhlich and F. R. N. Nabarro. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 129-134.

At sufficiently low temperatures metals become ferromagnetic owing to an orientation of the nuclear spins. The domain structure of such ferromagnetics is analogous to that of ordinary ferromagnetics.

3A-115. Transmission of Elastic Pulses in Metal Rods. D. S. Hughes, W. L. Pondrom, and R. L. Sims. *Physical Review,* ser. 2, v. 75, May 15, 1949, p. 1552-1556.

Pulses are generated at one end of a cylindrical rod by a quartz crystal. A second crystal at the opposite end acts as a detector. Transmission time is studied as a function of rod length, diameter, and material. Block diagram of apparatus, pulse diagrams, and tables. Rotational and dilatational velocities can be computed and hence elastic constants of material.

3A-116. Measurement of the Internal Friction of Solids. R. Kamel. *Physical Review,* ser. 2, v. 75, May 15, 1949, p. 1606.

Internal friction of a number of metallic solids and glass was determined from transverse vibrations. Two methods were employed: decay of free lateral vibrations and width of resonance.

3A-117. Weiterentwicklung der Festigkeitsrechnung bei Wechselbeanspruchung. (Further Development of the Calculation of Stress Under Alternating Stresses.) Erich Siebel and Max Pfender. *Stahl und Eisen,* v. 66-67, Sept. 11, 1947, p. 318-321.

Calculation of fatigue strength of materials subjected to different types of stress under different conditions. Theory of fatigue strength under alternating stresses.

3A-118. Betrachtungen uber den Elastizitätsmodul der Metalle und Legierungen. (Observations on the Modulus of Elasticity of Metals and Alloys.) Werner Köster. *Zeitschrift fur Metallkunde,* v. 39, May 1948, p. 145-158.

Data on modulus of elasticity of all of the metals were correlated in relation to position in the periodic table, thermoelastic properties, and temperature. Conditions that affect the modulus of continuous and limited solid-solution series of alloys and intermetallic compounds. 37 ref.

3A-119. Studies on Fly-Ash Erosion. M. A. Fisher and E. F. Davis. *Mechanical Engineering,* v. 71, June 1949, p. 481-487.

Previously abstracted from *American Society of Mechanical Engineers,* item 3A-31, 1949.

3A-120. Reactions of Metals in High Vacua. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of Physical & Colloid Chemistry,* v. 53, May, 1949, p. 690-711.

Previously abstracted from "Pittsburgh International Conference on Surface Reactions", item 3A-42, 1949.

3A-121. German Work on the Physics of Solids. A. M. Adams and A. J. Sandor. *British Coal Utilisation Research Association, Monthly Bulletin,* v. 13, Mar. 1949, p. 73-84.

A review based on the contents of Vol. I of a recently abstracted book: "Physik der Festen Korper", Georg Joos, editor, which is one of a series of FIAT reviews of German science being issued by the Office of Military Government for Germany. Selected passages are translated, together with comments on parallel advances in Allied countries. Subjects covered are structure, mechanical and thermal properties, and diffusion. Only the more important references from the original book are included, but 23 additional ones have been added. 129 ref.

3A-122. Some New Aspects of the Strength of Alloys. George-Maria Schwab. *Transactions of the Faraday Society,* v. 45, Apr. 1949, p. 385-396.

Temperature coefficient of the Brinell hardness of metals can be represented by a bi-exponential formula, leading to the assumption of two different processes with different activation energies, of which the larger one is connected with the formation of new perturbation centers. The Brinell hardnesses of the phases of the Hume-Rothery systems Cu-Zn, Cu-Sn, Ag-Zn, and Ag-Cd were measured between 20 and 450° C. in a special apparatus and evaluated according to the above theory. 22 ref.

3A-123. Repartition des charges dans les cables Aluminium-Acier; coefficient de dilatation lineaire et module d'elasticite. (Distribution of Loads in Aluminum-Steel Cables; Coefficient of Linear Expansion and Modulus of Elasticity.) Pierre Chapoulie. *Revue de l'Aluminium,* v. 26, Apr. 1949, p. 115-122.

Method for calculation of mechanical properties of Al-Fe cables is based on assumption of uniform behavior (that is, as if the conductor were homogeneous). Doubts have been expressed as to the validity of this assumption. Results of experiments over a wide range of conditions showing that mechanical characteristics are influenced by temperature and that the variations are too important to be ignored.

3A-124. Influence des fluctuations thermiques sur l'aimantation de grains ferromagnetiques tres fins. (Influence of Thermal Fluctuations on the Magnetization of Very Fine Ferromagnetic Particles.) Louis Néel, *Comptes Rendus,* v. 228, Feb. 21, 1949, p. 664-666.

A theoretical, mathematical analysis.

3A-125. Relations entre les perturbations du reseau metallique et la durete due a l'ecrouissage. (Relations Between Deformations in Metallic Systems and Hardness Caused by Cold Working.) W. Boas. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 84-88; discussion, p. 88.

Critically analyzes existing data, mostly obtained by X-ray methods. On the basis of this analysis, a new interpretation of the relationship is proposed. 39 ref.

3A-126. Pyrophoric Metals. (In Russian.) D. A. Pospekhov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Jan. 1949, p. 5-12.

A number of metals which have been obtained in the pyrophoric state. On the basis of theory, conversion of Al, Ge, Hf, Cb, Ta, Mo, and Re to the pyrophoric state seems possible. The nature of pyrophoric metals has been investigated but little, particularly the connection between pyrophoric and catalytic properties. 129 ref.

3A-127. The Theory of Electrical Conductivity of Monovalent Metals. (In Russian.) F. G. Serova. *Zhurnal Eksperimental 'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Feb. 1949, p. 126-134.

Analyzes Bardin's theory. Results of experiments indicate that, for lithium, theoretical data are in much better correspondence with experimental data during use of the wave functions of electron conduc-

Announcing the

FOURTH

Metallographic Exhibit

to be held at the National Metal Congress and Exposition in Cleveland, Oct. 17 to 21, 1949. Rules are simple and few; there are no restrictions as to size or method of mounting. A large area in the exhibition hall has been reserved so the entries can be displayed to best advantage.

RULES FOR ENTRANTS

Work which has appeared in previous Metallographic Exhibits is unacceptable.

Photographic prints shall be mounted on stiff cardboard, each on a separate mount. Each shall carry a label giving:

Name of metallographer
Classification of entry
Material, etchant, magnification
Any special information as desired

Transparencies or other items to be viewed by transmitted light must be mounted on light-tight boxes wired for plugging into an ordinary lighting circuit, and built so they can be fixed to the wall.

Exhibits must be delivered between Oct. 1 and Oct. 12, 1949, preferably by prepaid express or registered parcel post.

Address: Metallographic Exhibit,
c/o W. H. Eisenman
National Metal Congress and Exposition
Cleveland Public Auditorium, Cleveland, Ohio

CLASSIFICATION OF MICROGRAPHS

1. Cast Irons and Cast Steels
2. Toolsteels (except carbides)
3. Irons and Alloy Steels (excluding stainless) in Wrought Condition
4. Stainless and Heat Resisting Steels and Alloys
5. Light Metals and Alloys
6. Heavy Nonferrous Metals and Alloys
7. Powder Metals (and carbides) and Compacts
8. Weld Structures (including brazed and similar joints)
9. Series of Micros showing Transitions or Changes During Processing
10. Surface Phenomena and Macrographs of Metallurgical Objects or Operations (2 to 10 diam.)
11. Results by Non-Optical or other Unconventional Techniques.

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a first prize (a blue ribbon) to the best in each classification. Honorable Mentions will also be awarded other photographs which in the opinion of the judges closely approach the winner in excellence.

A Grand Prize, in the form of an engrossed certificate, and a money award of $100 will be awarded the exhibitor whose work is adjudged "best in the show", and his exhibit shall become the property of the American Society for Metals for preservation and display in the Sauveur Room at the Society's Headquarters. All other exhibits will be returned to owners by prepaid express or registered parcel post during the week of Oct. 23, 1949.

Entrants living outside the U. S. A. will do well to send micros by first-class letter mail endorsed "May be opened for Customs inspection before delivery to addressee".

31st NATIONAL METAL CONGRESS

CLEVELAND PUBLIC AUDITORIUM, CLEVELAND

October 17 to 21, 1949

tivity than during use of plane waves. A new formula is proposed for calculation of the above. Determinations for Li, Na, and K indicate validity of the formula.

3A-128. Theory of Surface Tension of Metals. (In Russian.) A. E. Glauberman. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, Feb. 1949, p. 115-123.

Value of the surface tension of a metal is determined by the excess potential energy of surface particles, which is in full accord with Frenkel's theory. Data obtained by using the proposed equations agree completely with experimental results.

3A-129. Mechanics of Rough Elastic-Plastic Bodies. I. Generalized Equation of Motion. II. Shear. (In Russian.) A. I. Gubanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Jan. 1949, p. 34-61.

Theoretical, mathematical analyses. Equations are derived and interpreted for different values of the variables. 15 ref.

3A-130. Magnetic Structure of Highly Coercive Alloys. I. Certain Peculiarities of the Curves of Magnetization and the Hysteresis Loop of the Highly Coercive Alloys Alnico and Vicalloy. L. A. Shubina and Ya. S. Shur. **II. Influence of Thermomagnetic Treatment on Electrical Resistance of the Highly Coercive Alloy, Alnico.** (In Russian.) V. I. Drozhzhina, M. G. Duzhinskaya, and Ya. S. Shur. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Jan. 1949, p. 88-97.

Data confirming the hypothesis of the authors concerning the magnetic structure of the above alloys. The "Alnico" investigated contained 51% Fe, 24% Co, 8% Al, and 3% Cu the "Vicalloy", 52% Co, 38% Fe, and 10% V.

3A-131. Resistance to Deformation During Plastic Flow of Polycrystalline Metals. (In Russian.) P. O. Pashkov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Feb. 1949, p. 251-270.

The possibility of formulating a single criterion for strength of polycrystalline metals under marked plastic deformation. Bibliographic data and the author's experiments confirm the acceptability of the proposed criterion. 17 ref.

3A-132. Uniformity of Conditions of Strength and Plasticity. (In Russian.) G. V. Uzhik. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 1, 1949, p. 471-474.

Analyzes the above, taking into consideration the resistance of metals to fracture under conditions of elastic deformation, a factor not considered in contemporary theories of strength of materials.

3A-133. Kann ein Metall bei der plastischen Deformation vorubergehend schmelzen? (Can Plastic Deformation Cause a Metal to Melt Temporarily?) Georg Masing. *Zeitschrift fur Metallkunde*, v. 40, Mar. 1949, p. 89-93.

Critical examination of earlier propositions by Poynting, Johnston, and Niggli indicates that the answer to the above question is in the negative. 13 ref.

3A-134. Medidas Eficientes da Dutilidade e Capacidade de Deformacao de Metais. (Effective Determination of Ductility and Deformation Capacity of Metals.) Werner Grundig. *Boletin da Associacao Brasileira de Metais*, v. 5, Jan. 1949, p. 68-91.

Modern methods. Factors involved, such as chemical composition, crystal structure, method of production, heat treatment, cold working, and their influence on ductility and deformation capacity. 13 ref.

3A-135. (Book) **Metallurgy and Magnetism.** J. K. Stanley. 150 pages. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio. $4.00.

An introductory text on ferromagnetism and types of magnetic materials. Magnetic theory, factors affecting magnetic properties, methods of using various magnetic properties to study metallurgical and solid-state problems.

3A-136. (Book) **Properties of Metals in Materials Engineering.** 177 pages. 1949. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio.

Eight educational lectures presented at 30th National Metal Congress and Exposition of A.S.M., Philadelphia, Oct. 23-29, 1948. Fundamental concepts, behavior under direct or nonreversed loading, application of fatigue data to machine design, determination of state of stress, analysis of stress in aircraft engines, testing to specific deflections, and design for energy absorption. 68 ref.

3B—Ferrous

3B-108. Izod, Tensile and Hardenability Tests on Some Aircraft Steels of Australian Manufacture. A. R. Edwards and F. G. Lewis. *Council for Scientific and Industrial Research, Commonwealth of Australia*, Aeronautical Research Report ACA-38, Jan. 1948, 23 pages.

Izod properties of above steels in five conditions of heat treatment at temperatures of −50 to 50° C. Tensile, hardness, and hardenability tests at room temperature, together with chemical analyses and metallographic examinations.

3B-109. The Mechanical Properties Avialable in Cast Iron. J. E. Hurst. *Pig Iron Rough Notes*, Winter-Spring 1949, p. 19-25.

Breaking, torsional, fatigue, and impact strength. Modulus of elasticity and permanent set, damping capacity, hardness, and resistance to wear.

3B-110. Fundamental Concepts. M. Gensamer. *American Society for Metals*, "Properties of Metals in Materials Engineering", 1949, p. 5-16.

Reasons for measuring mechanical properties. Flow and fracture.

3B-111. The Physics of Sheet Steel. 25. The Problem of Cyclic Magnetisation. (Concluded.) G. C. Richer. *Sheet Metal Industries*, v. 26, May 1949, p. 965-970.

Final installment on cyclic magnetization describes evaluation of the Steinmetz coefficient, and discusses use of the Yensen equations. Economic barriers to achievement of theoretically attainable low hysteresis losses. (Series to be continued.)

3B-112. Some Notes on Brittleness in Mild Steel. Johan Görrissen. *Journal of the Iron and Steel Institute*, v. 162, May 1949, p. 16-28.

Brittle fracture in unkilled mild steel with special reference to effect of grain size and structure. It was confirmed that grain boundary cementite is not formed above the A_1 temperature, but is formed during slow cooling from A_3 to room temperature. Steels containing 0.05-0.30% Si or 1.25-1.50% Mn are considered more suitable than mild steel for chain-making. Addition of Al is beneficial in controlling grain size and reducing liability to aging. Up to 0.25% C does not affect impact value. Need for controlled cooling rates, not too fast or too slow. 12 ref.

3B-113. The Action of Boron in Hardening Steel. *Industrial Heating*, v. 16, May 1949, p. 818, 820, 822.

Previously abstracted from *Journal of Research of the National Bureau of Standards*, item 3B-21, 1948.

3B-114. Ferromagnetic Resonance at Microwave Frequencies in an Iron Single Crystal. Arthur F. Kip and Robert D. Arnold. *Physical Review*, ser. 2, v. 75, May 15, 1949, p. 1556-1560.

Resonance absorption was observed at 23,675 and 9260 mc. per sec., using an external magnetic field applied perpendicular to the r.f. magnetic field in the plane of the crystal surface.

3B-115. Stand und Entwicklung der spektrochemischen Analyse (Emissions-Analyse.) [Status and Development of Spectrochemical Analysis (Emission Analysis).] Heinrich Kaiser. *Zeitschrift fur Angewandte Physik*, v. 1, Jan. 1948, p. 35-45.

A review. 127 ref.

3B-116. Bericht uber die Eigenschaften der technisch wichtigen sinterbaren Dauermagnetlegierungen des Metallsystems Eisen-Nickel-Aluminium mit Zusätzen von Titan und Kobalt. (Report on the Properties of the Commercially Important Sinterable Permanent Magnet Alloys of the Iron-Nickel-Aluminum System With Titanium and Cobalt Additions.) Wilhelm Zumbusch. *Zeitschrift fur Angewandte Physik*, v. 1, Jan. 1948, p. 45-47; Mar. 1948, p. 98-104.

3B-117. Investigation of Temper Brittleness in Low-Alloy Steels. S. A. Herres and A. R. Elsea. *Journal of Metals*, v. 1, sec. 3, June 1949 (*Metal Transactions*, v. 185), p. 366-370.

Notched-bar impact values at 75 and −40° F. of specimens of 20 steels water quenched and furnace cooled from the tempering temperature.

3B-118. Vanadium Data Sheet: Vanadium Alloyed Irons. R. G. McElwee. *Vancoram Review*, v. 6, no. 1, [1948], p. 12-13.

Compositions, mechanical properties, and applications.

3B-119. Effect of Manufacturing Practice on Creep and Creep-Rupture Strength of Low-Carbon Steel. G. V. Smith and E. J. Dulis. *American Society for Testing Materials*, Preprint 18, 1949, 16 pages.

Comparative tests at 850° F. on 12 heats of low-carbon steel made by different melting and deoxidation practices show a rather wide range in results dependent chiefly upon deoxidation practice. 13 ref.

3B-120. Present Knowledge of Low-Carbon 18-8. H. W. Gillett. *American Society for Testing Materials*, Preprint 22, 1949, 14 pages.

Austenite stability, carbide precipitation, weldability, and corrosion resistance. 46 ref.

3B-121. Magneto-Thermal Effects in Ferromagnetics. E. C. Stoner and P. Rhodes. *Philosophical Magazine*, ser. 7, v. 40, May 1949, p. 481-522.

Quantitative treatment of the basic effects. 31 ref.

3B-122. Properties of Stainless Steel Fasteners. Richard E. Paret. *American Machinist*, v. 93, June 2, 1949, p. 129.

3B-123. How Boron Affects Steel Hardenability. *Steel*, v. 124, June 6, 1949, p. 105, 135-136, 138.

Previously abstracted from *Journal of Research of the National Bureau of Standards*, item 3B-21, 1949.

3B-124. Cast Ferrous Materials for Subzero Service. John W. Juppenlatz. *Iron Age*, v. 163, June 9, 1949, p. 46-49.

Suitability of ferritic and austen-

itic steels at various temperature levels. Effect of temperature on tensile and impact properties of cast 19-9 stainless steel.

3B-125. Sur les propriétés mécaniques des pieces de forge en aciers a faibles teneurs en nickel, chrome et molybdene. (Mechanical Properties of Steel Forgings Containing Small Amounts of Nickel, Chromium, and Molybdenum.) R. Potaszkin. *Revue de Métallurgie,* v. 46, Mar. 1949, p. 125-140; discussion, p. 140.

Specimens contained 0.28-0.46% C; 0.26-0.35% Si; 0.78-1.11% Mn; 0.60-0.81% Ni; 0.50-0.60% Cr; and 0.16-0.27% Mo. Data on mechanical properties and effect of heat treatment on them, and on microstructure, are presented and compared with those of low-alloy Ni-Cr-Mo, Ni-Cr, and Cr-Mo steels.

3B-126. Work Expended in Destruction of Multi-Strip Specimens as a Function of Number of Strips. (In Russian.) G. I. Pogodin-Alexeev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 345-351.

Investigated for two different alloy steels. Specimens of the same thickness, but made up of different numbers of separate leaves joined at the ends, were subjected to bending and to compressive stresses. The number of leaves varied from 3 to 20. Obtained results.

3B-127. Plasticity of Steel and Smoothness of Its Working Surfaces. (In Russian.) F. P. Rybalko and M. V. Yakutovich. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 11, 1949, p. 673-674.

The above was studied for samples quenched from 800° C. and annealed in the salt bath at 200, 300, 400, 500, 600, and 650° C., with rough and polished surfaces. It was found that the torsion strength of polished specimens is higher than that of rough surfaces, particularly in the annealing range between 300 and 600° C.

3B-128. Ueber 12%-Mangan-Stahlguss. (Cast Steel Containing 12% Mn.) H. Resow. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Mar. 1949, p. 67-74.

Effect of carbon content, of other alloying elements, and of quenching temperature on toughness and hardness. Tensile, impact, and compression tests were made to determine the type of working that produces maximum hardness and depth of hardness. Relationship of hardness on the wall thickness.

3B-129. Der Einfluss der Dehngeschwindigkeit auf die Zugfestigkeit und Dehnung austenitischer Stähle. (The Effect of Rate of Elongation on the Tensile Strength and Elongation of Austenitic Steels.) Wilhelm Puzicha and Alfred Krisch. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 93-98.

Investigated for three Cr-Ni and three Cr-Mn steels at rates of 0.4-150% per min. 15 ref.

3C—Nonferrous

3C-98. Preparation and Properties of Some Gold Alloys. A. U. Seybolt. *U. S. Atomic Energy Commission,* AECD-2434; LADC-141, Sept. 30, 1943, 6 pages.

Samples of gold and five gold alloys were prepared and tested for hardness, yield strength in compression, and density. They contained approximately 5 and 10% Ni, and 10% each of Mn, Fe, and U. Microstructures.

3C-99. Resistance in the Intermediate State. E. R. Andrew. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 101-104; discussion, p. 127-128.

Theory and some resistance measurements with polycrystalline wires of spectroscopically pure tin. Some have been prepared by extrusion; others were drawn into glass capillaries. Both types behaved in the same manner.

3C-100. The Thermal Properties of Superconductors. J. G. Daunt. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 104-108.

Recent work and its theoretical interpretation.

3C-101. The High-Frequency Resistance of Superconducting Tin. H. London. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 109-112; discussion, p. 127-128.

Experimental data and their theoretical interpretation.

3C-102. Resistance of Superconductors at Microwave Frequencies. A. B. Pippard. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 113-118; discussion, p. 127-128.

Experimental results on tin and mercury.

3C-103. Some Measurements of the Electrical Resistance of Thin Metallic Films. A. Van Itterbeek. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 118-124; discussion, p. 127-128.

Data on films of Cu, Ag, Ni, Pb, and Bi made both by vacuum evaporation and by cathodic sputtering.

3C-104. Calorimetric Measurements on Normal and Superconductive Tantalum. Maurice Désirant. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 124-127; discussion, p. 127-128.

Experimental results obtained at the Kamerlingh Onnes Laboratory and the Clarendon Laboratory.

3C-105. Solid Solubility Effect of Metallic Surface Friction. Kwai Umeda and Yoshihiro Nakano. *Physical Review,* ser. 2, v. 75, May 15, 1949, p. 1621.

Experimental results for a series of nonferrous alloys.

3C-106. Elastizitätsmodul und Dämpfung von Zink-Einkristallen. (Modulus of Elasticity and Damping of Zinc Monocrystals.) Gerhard Reinacher and Erich Scheil. *Zeitschrift fur Metallkunde,* v. 39, Aug. 1948, p. 231-232.

Temperature dependence was determined for five differently oriented monocrystals.

3C-107. Eigenschaften und Anwendung metallischer Gleitlagerwerkstoffe. (Properties and Applications of Bearing Alloys.) Richard Weber. *Zeitschrift fur Metallkunde,* v. 39, Aug. 1948, p. 240-247.

70 ref.

3C-108. Uber eine neue Widerstandslegierung der Kupfer-Mangan-Gruppe fur Normalwiderstände. (A New Resistance Alloy of the Copper-Manganese Group for Normal Resistances.) Alfred Schulze. *Metall,* Sept. 1948, p. 291-295.

The alloy of the above group designated as 306, was investigated with rsepect to physical and electrical properties. Variations corresponding to different heat treatments.

3C-109. P-Type and N-Type Silicon and the Formation of the Photovoltaic Barrier in Silicon Ingots. J. H. Scaff, H. C. Theuerer, and E. E. Schumacher. *Journal of Metals,* v. 1, sec. 3, June 1949 (*Metal Transactions,* v. 185), p. 383-388.

Electrical properties and preparation of the above semiconductors. Conductivity at room temperature results principally from the presence of metallic impurities. The effects of various impurities.

3C-110. The Influence of Vibration on the Creep of Lead. J. Neill Greenwood. *American Society for Testing Materials,* Preprint 29, 1949, 17 pages.

Creep tests on two industrial leads (both very pure) and two Pb alloys, one containing 0.027% Ag and the other 0.07% Cu, were made with 50 cycles per sec. vibration superimposed on direct tensile stresses of 100-350 psi. Vibration increases creep rate and accelerates recrystallization under stress. 13 ref.

3C-111. Magnetism in Copper Alloys: The Effect of Iron as Impurity. Alison Butts and Paul L. Reiber, Jr. *American Society for Testing Materials,* Preprint 34, 1949, 27 pages.

Magnetic susceptibilities and residual magnetic moments of 19 Cu alloys containing varying percentages of Fe as impurity were measured under different conditions of thermal and mechanical treatment. Data on which specifications may be based for maximum Fe content in alloys for the construction of instruments in which only weakly magnetic materials are permissible. A solution-quenching treatment lowered the magnetic properties of most of the alloys. A general pattern for increase in magnetism with Fe content was found. The correlation of magnetic properties with alloy composition. 10 ref.

3C-112. The Freezing Point of Uranium. A. I. Dahl and H. E. Cleaves. *U. S. Atomic Energy Commission,* AECD-2541, Mar. 22, 1949, 8 pages.

Reviews previous studies on physical properties. Work on the freezing point of uranium. 10 ref.

3C-113. Effect of High Shear Rate on Erosion of Common Bearing Metals. Charles D. Strang and Thomas P. Clark. *National Advisory Committee for Aeronautics,* Technical Note No. 1887, June 1949, 25 pages.

Specimens of copper, silver, and lead were subjected to oil flowing at mean surface-shear rates of 1.5×10^6 reciprocal seconds for periods of 6 hr. Separate investigations were carried out with filtered and unfiltered oil. Apparatus.

3C-114. Pressure Change of Resistance of Tellurium. J. Bardeen. *Physical Review,* ser. 2, v. 75, June 1, 1949, p. 1777-1778.

The large change of resistivity with pressure is a result of a decrease in the energy gap, the gap becoming very small at 30,000 kg. per sq. cm. At a somewhat higher pressure (45,000 kg. per sq. cm.), Te undergoes a phase transition. The high-pressure modification may well be a true-metallic phase.

3C-115. Plaster-Mold Castings; Selections of Materials and Design Considerations. W. G. Wilkins. *Machine Design,* v. 21, June 1949, p. 114-118, 192, 194-195.

3C-116. Quelques données sur la conduction électrique des couches tres minces de divers métaux sur différents supports. (Some Data on the Electrical Conductivity of Very Thin Coatings of Different Metals on Different Bases.) Eugene Darmois, Nicolas Mostovetch, and Boris Vodar.

Comptes Rendus, v. 228, Mar. 21, 1949, p. 992-993.

Results of an experimental study for coatings of W, Mo, Ta, Rh, Pt, and Ni on glass, mica, and fused quartz.

3C-117. Magnetic Structure of Highly Coercive Alloys. III. Curves of Magnetostriction of the Highly Coercive Alloys, Alnico and Vicalloy. (In Russian.) D. A. Shturkin and Ya. S. Shur. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Feb. 1949, p. 235-242.

Magnetostriction curves of these alloys. Their compositions and heat treatments were described in a previous article by the same authors for different conditions of the magnetic structure.

3C-118. Magnetic Susceptibility of the Intermetallic Compound Mg_2Sn. (In Russian.) B. I. Boltaks. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 1, 1949, p. 487-489.

Investigated between —170 and 400° C. Dependence of magnetic susceptibility on deviation from stoichiometric composition and on temperature. Increase of diamagnetic susceptibility with temperature.

3C-119. Electrical Properties of the Intermetallic Compound Mg_2Sn. (In Russian.) B. I. Boltaks. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 11, 1949, p. 653-656.

Were investigated, particularly the relationship of specific conductivity to temperature and to deviation from stoichiometric composition, variation of Hall effect with temperature, and thermal emf. Results indicate that Mg_2Sn may be classed as a semiconductor.

3C-120. Uber die Besonderheiten der Edelmetallegierungen im Schmuckgewerbe. (The Characteristics of the Noble Metal Alloys Used in Jewelry.) Josef Leuser. *Metall*, Apr. 1949, p. 105-110.

Color, hardness, structure, stress corrosion, and hardenability of Au-Ag-Cu alloys. Phase diagrams.

3C-121. Hartchromschichten höchster Verschleissfestigkeit. (Hard-Chromium Deposits of Maximum Wear Resistance.) Walter Eilender, Heinz Arend, and Eugen Schmidtmann. *Metalloberfläche*, v. 3, Mar. 1949, p. 57-59.

Results of experiments made to determine the correlation of hardness and wear resistance. Maximum wear resistance was found at Vickers hardnesses of about 750 kg. per sq. mm., with lessened resistance for both lower and higher hardnesses.

3C-122. Bildungswärmen Zintl'scher Erdelkaliverbindungen. XIII. Zur Thermochemie der Legierungen. (The Heats of Formation of Zintl's Alkaline Earth Compounds. XIII. The Thermochemistry of the Alloys.) O. Kubaschewski and H. Villa. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie*, v. 53, Jan. 1949, p. 32-40.

Heats of formation of the systems B-Bi, Ba-Sb, Ba-Pb, Ba-Sn, Ca-Sn, Ca-Si, and Mg-Si were determined with a simplified adiabatic calorimeter. 35 ref.

3D—Light Metals

3D-38. New General-Purpose Aluminum Sheet Alloy. *Modern Metals*, v. 5, May 1949, p. 17-19.

New commercial Al-Mg alloy, 150S, and its properties and typical applications. It is designed to fill a gap between 3S and 52S.

3D-39. Presseffekt und Biegedauerfestigkeit einiger Aluminium-Kupfer-Magnesium-Knetlegierungen mit verschiedenen Mangangehalten. (Effect of Forging on the Fatigue Bending Strength of Several Aluminum-Copper-Magnesium Alloys With Varying Manganese Contents.) Walter Bungardt and Eugen Osswald. *Zeitschrift fur Metallkunde*, v. 39, June 1948, p. 185-189.

Static and dynamic tests were made on round bars made either by forging only or by forging followed by cold drawing for seven Al-Cu-Mg alloys containing 0-1.6% Mn, 4-4.5% Mg, 1% Cu, 0.5% Si, and 0.4% Fe. 17 ref.

3D-40. Die Dauerstandfestigkeit der Magnesiumlegierungen. (The Fatigue Strength of Magnesium Alloys.) Hugo Vosskuhler. *Zeitschrift fur Metallkunde*, v. 39, July 1948, p. 193-204.

A fatigue-strength testing machine and results of its use on a number of commercial Mg alloys under constant load and temperature.

3D-41. Ueber den Einfluss von Zink auf einige Eigenschaften technischer Aluminium - Kupfer - Magnesium - Knetlegierungen. (The Effect of Zinc on Several Properties of Commercial Aluminum-Copper-Magnesium Malleable Alloys.) Walter Bungardt and Hanns Grober. *Metall*, July 1948, p. 217-220.

Effects on hardness, static and dynamic strength, density, and sensitivity to high temperatures. Their ability to be bent, drawn, and worked; their tendency to form coarse granular structures; and their behavior with respect to corrosive agents. The testing procedure.

3D-42. Versuche zur Entwicklung einer hochfesten Aluminium-Magnesium-Zink-Knetlegierung. (Experiment Made to Develop a High-Test Aluminum-Magnesium-Zinc Malleable Alloy.) G. H. Vosskuhler. *Metall*, Aug. 1948, p. 251-258; Sept. 1948, p. 288-291.

A comprehensive report showing the effect of various additions (such as Cu, Cr, Ti, Mn, Fe, Zr, and Si) on the physical properties of these alloys. 13 ref.

3D-43. Creep and Stress-Rupture Investigations on Some Aluminum Alloy Sheet Metals. J. E. Dorn and T. E. Tietz. *American Society for Testing Materials*, Preprint 26, 1949, 17 pages.

3S-H12, 3S-H18, 52S-H32, 52S-H38, 61S-T6, and 24S-T3 were investigated. From 90 to 400° F., the above sequence of alloys was found to be in order of increasing resistance to creep and stress rupture. Cold rolling appears to have a beneficial effect. The data for 3S-H12 and also 3S-H18 are analyzed in terms of Hollomon's theory of creep. Results did not correlate well with experiment.

3D-44. The Creep Strength at 200 C. of Some Magnesium Alloys Containing Cerium. G. A. Mellor and R. W. Ridley. *Journal of the Institute of Metals*, v. 75, Apr. 1949, p. 679-692.

A number of the alloys were tested as cast, as rolled, and as rolled and heat treated. Little advantage was gained by increasing the Ce content beyond 1½-2%. Rolled alloys are markedly inferior to cast alloys unless they are solution treated. Slight age hardening took place in alloys containing 0.5-6% Ce.

3D-45. Properties of Heat-Treatable Aluminum Alloys Used for Drawing and Spinning; Properties of Non-Heat-Treatable Aluminum Alloys Used for Drawing and Spinning. *Machinery*, v. 55, June 1949, p. 253.

Ultimate tensile strengths, yield strengths, elongations for 1/16-in. sheet, and Brinell hardnesses.

3D-46. 75S Aluminum Alloy. C. C. Hurlburt. *Materials & Methods*, v. 29, June 1949, p. 83, 85.

Available forms, chemical composition, corrosion resistance, mechanical and physical properties, processing and fabrication, thermal treatment, and minimum bend radii.

3D-47. Les renseignemenst fournis par des essais de fatigue sur l'état cristallin des toles. (Information Concerning the Crystalline State of Sheet Metal Obtained From Fatigue-Test Data.) R. Jacquesson and P. Laurent. *Revue de Métallurgie*, v. 46, Feb. 1949, p. 89-99; discussion, p. 100-101.

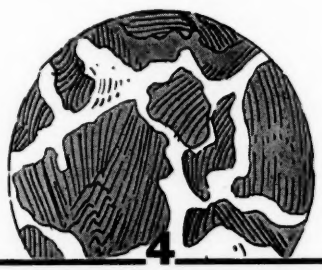
Resistance to dynamic stress of Al sheet was studied as a function of crystal orientation and degree of cold working. The evolution of the crystalline state as a function of the frequency of stress application (in this case, 9000 cycles per min.).

3D-48. (Book) **Aluminium and Its Alloys.** S. A. J. Sage. Emmott & Co., Ltd., 31 King St. West, Manchester 3, England. 2s. 6d. net.

Normal range of Al alloys and their associated mechanical properties. The alloys dealt with include Al alloyed with Cu, Si, Mg, and Zn, plus the more complex alloys. Both castings and forgings.

For additional annotations indexed in other sections, see:

4B-48-53-57; **6D**-20; **7B**-107; **9**-152-158; **23B**-24



CONSTITUTION and STRUCTURE

4A—General

4A-53. The System Iron-Tin: Liquidus Only. A. N. Campbell, J. H. Wood, and G. B. Skinner. *Journal of the American Chemical Society*, v. 71, May 1949, p. 1729-1733.

Eutectic temperature and composition of the above system were determined. The equilibrium curve for the Sn-Fe solid phase in contact with the liquid phase was determined from the melting point of Sn up to 1134° C., the temperature of the miscibility gap. Existence of a miscibility gap was proved and its limits determined from 1134 to 1300° C.

4A-54. The Fundamentals of Recrystallization and Grain Growth. J. E. Burke. *American Society for Metals*, "Grain Control in Industrial Metallurgy", 1949, p. 1-73.

Mechanisms and laws which govern the above. 96 ref.

4A-55. Zur Entstehung der Blockstrukturen elektrolytisch gewachsener Metallkristalle. (The Formation of Block Structures of Electrolytically Grown Metal Crystals.) Hellmut Fischer. *Metaloberfläche*, v. 2, Oct. 1948, p. 219-220.

Effect of moderate currents and inhibitors on the formation of base-oriented structures and the effect

of increased currents and intensified inhibitors on the formation of "field-oriented" structures. 13 ref.

4A-56. The Sigma Phase in Ternary Cr-Co-Fe and Cr-Co-Ni Alloys. Paul A. Beck and W. D. Manly. *Journal of Metals*, v. 1, sec. 3, June 1949 (*Metal Transactions*, v. 185), p. 354.

New experimental results.

4A-57. On the Bond Lengths and Interatomic Distances in Certain Molecules and Crystals. W. Hume-Rothery. *Proceedings of the Royal Society*, ser. A, v. 197, May 11, 1949, p. 17-27.

Internuclear distances in the crystals of some of the elements at absolute zero were calculated, and the values are examined and compared with those in some molecules. Several whole-number relationships are found to exist between squares of bond lengths and atomic numbers.

4A-58. Application of Similarity to Anelasticity. M. T. Thring. *Nature*, v. 163, May 14, 1949, p. 772-773.

Applies dimensional analysis in an attempt to derive a dimensionless criterion for the ratio of the relaxation time to vibration time. Method which includes the effect of grain size. Discusses work of Ke, Zener, and Mott.

4A-59. Statistical Mechanics of Some Co-Operative Phenomena. C. Domb, *Nature*, v. 163, May 14, 1949, p. 775-776.

Analysis applicable to a number of the above associated with specific heat singularities for which the mathematics is formally similar. These include the Ising model of a ferromagnet, the theory of regular binary solid solutions, and order-disorder transitions in alloys.

4A-60. Mechanism of Creep in Metals. G. R. Wilms and W. A. Wood. *Journal of the Institute of Metals*, v. 75, Apr. 1949, p. 693-706.

How the mechanism by which a metal deforms at elevated temperatures differs from that at normal temperature, and how the difference depends on the rate of deformation.

4A-61. Symposium sur la structure mosaique des métaux. (Symposium Concerning the Mosaic Structure of Metals.) Ch. Crussard and A. Guinier. *Revue de Métallurgie*, v. 46, Feb. 1949, p. 61-71.

Ideas resulting from a discussion among a group consisting of the authors and Brasseur, Burgers, Coheur, Druyvestein, Homes, Jacquet, Lacombe, Laurent, and Rathenau. Surveys in turn available information obtained by use of X-rays, metallography, and by study of mechanical and physical properties. Conclusions and theoretical considerations. 67 ref.

4A-62. Plastic Deformation and Fracture of Polycrystalline Metals Under Tensile Stress. II. Form of Stress Diagrams of Pure Metals. (In Russian.) G. N. Kolesnikov, V. A. Pavlov, E. S. Yakovleva, and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Jan. 1949, p. 62-75.

For eight pure metals (β-Sn, Cd, Zn, Mg, Pb, Al, Cu, and α-Fe) at different temperatures (78° K.-0.8° C.) below the melting point or temperature of phase transformation. Stress diagrams of pure metals may be divided into two basic types: "high-temperature" and "low-temperature".

4A-63. (Book) **Grain Control in Industrial Metallurgy.** J. E. Burke, R. L. Kenyon, Henry Burghoff, and J. T. Hobbs. 279 pages. 1949. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio.

Four educational lectures presented to members of the A.S.M. during the 30th National Metal Congress and Exposition, Philadelphia, Oct. 23-29, 1948. Fundamentals of recrystallization and grain growth, its control in ferrous metals, copper, copper alloys, wrought aluminum, and magnesium products. Individual lectures separately abstracted. 266 ref.

4A-64. (Book) **Structures et Propriétés des Alliages Metalliques.** (Structure and Properties of Metallic Alloys.) L. Guillet. 206 pages. 1948. Dunod, 92 rue Bonaparte, Paris 6, France.

Designed for those having a considerable scientific and metallurgical background. Various theories, some of them quite controversial, are discussed on the basis of bibliographic data and results of the author's research. 326 ref.

4B—Ferrous

4B-45. Recrystallization and Grain Control in Ferrous Metals. R. L. Kenyon. *American Society for Metals*, "Grain Control in Industrial Metallurgy", 1949, p. 74-157.

Effect of deformation and subcritical annealing on ferrite grain size. Austenite grain-size control. 76 ref.

4B-46. Wechselbeanspruchung und Kristallzustand. (Alternating Stress and the Crystalline State.) Hermann Möller. *Stahl und Eisen*, v. 66-67, Dec. 4, 1947, p. 432-433.

Effect of alternating stress on the crystal structure of steel as revealed by X-ray diffraction.

4B-47. Gefugeeinfluss auf das Grenzschmierungsverhalten von Gusseisen. (Effect of Structure on the Boundary Lubrication Behavior of Cast Iron.) Johannes Kluge, Gerhard Bochmann, and Liselotte Fiddecke. *Zeitschrift fur Metallkunde*, v. 39, May 1948, p. 139-142.

It was found that the structure of the graphite in cast iron has an important effect on the frictional properties of the metal. The reciprocal effect between the metal surface and the residual valences of the molecule of the lubricant is found to be of decisive importance.

4B-48. Einfluss des bainitischen Gefuges auf die mechanischen Eigenschaften eines warmfesten Cr-Mo-Vergutungsstahles. (The Effect of Bainite Structure on the Mechanical Properties of a Heat-Resistant Cr-Mo Temper-Hardening Steel.) U. Wyss. *Von Roll Mitteilungen*, v. 7, Dec. 1948, p. 51-70.

New observations on the above and on the creep limit at 500° C. Test method and results. 19 ref.

4B-49. Gases and Non-Metallics: First Collective Report of the B.I.S.R.A. Sub-Committee. Part I. Introduction. W. W. Stevenson. **Part II. Determination of Oxygen in Liquid Steel by the Aluminium-Killed Bomb Method.** G. E. Speight. **Part III. Determination of Hydrogen in Liquid Steel.** G. E. Speight and R. M. Cook. **Part IV. A Co-Operative Examination of a Manganese-Molybdenum Steel. Part V. A Co-Operative Examination of a Nickel-Chromium Steel. Part VI. A Co-Operative Examination of the Distribution of Non-Metallic Inclusions in Billets From a Mild-Steel Ingot.** T. E. Rooney. *Iron and Steel*, v. 22, May 12, 1949, p. 213-224; discussion, p. 268-269.

Previously abstracted from *Journal of the Iron and Steel Institute*, item 10B-9, 1949.

4B-50. Si-Cr Valve Steel; Large Crystal Grain Size. C. C. Hodgson and H. G. Baron. *Iron and Steel*, v. 22, May 12, 1949, p. 225-228; discussion, p. 271.

Previously abstracted from *Journal of the Iron and Steel Institute*, item 4B-20, 1949.

4B-51. Grain Growth; Occurrence in Silicon-Chromium Valve Steel. H. Allsop and P. W. Bygate. *Iron and Steel*, v. 22, May 12, 1949, p. 228-238; discussion, p. 271.

Previously abstracted from *Journal of the Iron and Steel Institute*, item 4B-41, 1949.

4B-52. Alloy Steels; The Crystal Structure of Carbides. Part I. General Survey. H. J. Goldschmidt. *Iron and Steel*, v. 22, May 12, 1949, p. 239-246; discussion, p. 271-272.

Previously abstracted from *Journal of the Iron and Steel Institute*, item 4B-6, 1949.

4B-53. Contribution a l'étude des relations entre la structure micrographique de l'acier et sa vitesse de fluage. (Contribution to the Study of the Relationship Between Micrographic Structure of Steel and Its Rate of Creep.) Georges Delbart and Michel Ravery. *Comptes Rendus*, v. 228, Mar. 28, 1949, p. 1025-1027.

Assuming that resistance to creep depends on chemical composition and crystal structure, the author attempts to show the influence of the form of the ferrite present on the rate of creep, mostly at low temperatures. Investigation was performed on low-carbon steel (0.12% C, 0.60% Cr, 0.60% Mo). heat treated differently to obtain the following structures: pearlite-ferrite, bainite-ferrite, sorbite-ferrite, bainite, and sorbite.

4B-54. Determination of the Chemical Composition of Iron Carbide in Steel. (In Russian.) N. M. Popova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 264-266.

Method based on preparation of a glycerin suspension of the carbides and subsequent dissociation by acids. The carbide residue, isolated from carbon steels by an electrolytic method, and dissociated in HCl, indicates that the composition of iron carbide is independent of thermal treatment and corresponds to that of cementite.

4B-55. Petrographic and Chemical Characteristics of Nonmetallic Inclusions in Steel. (In Russian.) M. M. Shapiro. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 278-287.

A compilation of physical, chemical, and mineralogical properties of six main types of common inclusions. These data are obtained from the literature and from new work.

4B-56. Causes of the Existence of the Metastable System Iron-Cementite. (In Russian.) N. N. Sirota. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 11, 1949, p. 697-700.

Problem was theoretically investigated. Results of calculation of energy formation of graphite and cementite nuclei indicate that the rate of formation of dimeric nuclei and, therefore, the linear rate of growth of cementite nuclei, at a given temperature, is considerably higher than that of graphite dimeric nuclei. This fact explains the presence of the metastable iron-cementite system simultaneously with the stable system iron-graphite.

4B-57. Somatoider Graphit im Grauguss. (Nodular Graphite in Grav Iron.) R. Bertschinger. *Schweizer Archiv fur Angewandte Wissenschaft und Technik*, v. 15, Mar. 1949, p. 75-84.

Relationships between the various graphite forms, rate of cooling and the Fe-C-Si system; also factors affecting formation. The mechanical

properties of gray irons containing nodular graphite.

4B-58. Untersuchungen an korrosionsbeständigem Stahlguss auf Chrom-Nickel-Basis unter besonderer Berucksichtigung der Sigma-Phase. (Research on Corrosion-Resistant Chromium-Nickel-Molybdenum Cast Steel With Emphasis on the Sigma Phase.) W. Felix and E. Eisermann. *Schweizer Archiv fur Angewandte Wissenschaft und Technik*, v. 15, Mar. 1949, p. 84-92.

The effect of heat treating on formation of the sigma phase was investigated by examination of the structure and the mechanical and magnetic properties of the steel.

4B-59. Echter und unechter Stickstoffperlit. (True and Pseudo Nitrogen Pearlite.) Hermann Schottky. *Zeitschrift fur Metallkunde*, v. 40, Mar. 1949, p. 98-100.

A pearlite-like eutectoid (called braunite) of the Fe-N system formed from the gamma phase with 2.35% N at 590° C. 15 ref.

4C—Nonferrous

4C-50. The Structures of Uranium Metal. (In English.) A. S. Wilson and R. E. Rundle. *Acta Crystallographica*, v. 2, Apr. 1949, p. 126-127.

4C-51. X-Ray Powder Patterns of Boron Coated Mo and W. Filaments. St. v. Naray Szabo and Charles W. Tobias. *Journal of the American Chemical Society*, v. 71, May 1949, p. 1882-1883.

Method used for preparation of pure boron and boron tribromide and powder-pattern data.

4C-52. Recrystallization and Grain Size Control in Copper and Copper Alloys. Henry Burghoff. *American Society for Metals*, "Grain Control in Industrial Metallurgy", 1949, p. 158-208.

General properties as functions of grain size and effect of impurities on annealing. Commercial annealing practice. 38 ref.

4C-53. Die Legierungen des Zirkoniums mit Kupfer, Silber und Gold. (The Alloys of Zirconium With Copper, Silver, and Gold.) Ernst Raub and Max Engel. *Zeitschrift fur Metallkunde*, v. 39, June 1948, p. 172-177.

Constitution diagrams are based on thermo-analytical, microscopic, and X-ray examinations. Mechanical and chemical properties of these alloys are discussed and compared with the corresponding alloys of thorium.

4C-54. Beitrag zum System Nickel-Mangan. (Research on the Nickel-Manganese System.) Werner Köster and Walter Rauscher. *Zeitschrift fur Metallkunde*, v. 39, June 1948, p. 178-184.

System was re-examined by means of thermal analysis, by X-ray and microscopic methods, and by measuring magnetic properties and elastic behaviors. 14 ref.

4C-55. Das Dreistoffsystem Aluminium-Magnesium-Zinc. IV. Der Gleichgewichtsverlauf auf der Aluminium-Zink-Seite unterhalb 350°. (The Ternary Aluminum-Magnesium-Zinc System. IV. The Equilibrium Curve on the Al-Zn Side Below 350° C.) Werner Köster. *Zeitschrift fur Metallkunde*, v. 39, July 1948, p. 211-213.

Results of a study. The compositions studied contained 70-92.5% Zn.

4C-56. Mikroskopische und röntgenographische Untersuchungen zur Kenntnis des Systems Kupfer-Nickel-Aluminium. (Microscopic and X-Ray Investigations of the Copper-Nickel-Aluminum System.) Werner Köster, Ulrich Zwicker, and Kurt Moeller. *Zeitschrift fur Metallkunde*, v. 39, Aug. 1948, p. 225-231.

Areas of primary crystallization and phase boundaries of the system at 500, 700, and 900° C. Equilibrium curves for the entire system. 10 ref.

4C-57. Microstructures of Silicon Ingots. W. G. Pfann and J. H. Scaff. *Journal of Metals*, v. 1, sec. 3, June 1949 (*Metal Transactions*, v. 185), p. 389-392.

Results of a microscopic investigation of structures of rapidly and slowly cooled ingots.

4C-58. Presence of Molecular Compounds in Fundamental Ternary Solid Solutions of Aluminum. (In Russian.) T. A. Badaeva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 1, 1949, p. 533-536.

An Al-Mg-Si alloy (containing 99 atom % Al) and an Al-Mg-Zn alloy were investigated, by determination of electrical resistances in the range 480-550° C. Results indicate the presence of Mg_2Si, $MgZn_2$ and $MgZn_5$, in the respective alloys.

4C-59. Constitution Diagram and Mechanical Properties of the System Mg-Zn. (In Russian.) E. M. Savitskii and V. V. Baron. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 11, 1949, p. 693-696.

Attempts to determine the cause of controversial data concerning the presence, in the system, of different intermetallic compounds such as MgZn, Mg_2Zn_3, $MgZn_2$, $MgZn_5$, and Mg_2Zn_{11}. Experimental results indicate that the cause is difference in conditions of heat treatment of the specimens. Presence of MgZn, $MgZn_2$, and $MgZn_5$ was established, but not Mg_2Zn_3 and Mg_2Zn_{11}. Influence of temperature on mechanical properties of the alloys.

4D—Light Metals

4D-30. A Metallographic Study of Aluminum Alloy 3S. L. J. Barker. *Iron Age*, v. 163, May 26, 1949, p. 74-78.

Etching methods. Results reported indicate that background or secondary constituent structures carry through rolling and annealing operations and serve as a reliable guide to temper of the sheet, history of fabrication, and properties to be expected. Etchants, for development of the various structures.

4D-31. Grain Control in Wrought Aluminum and Magnesium Products. J. T. Hobbs, Jr. *American Society for Metals*, "Grain Control in Industrial Metallurgy", 1949, p. 209-271.

Methods of determining and reporting grain size. Factors effecting grain structure and effect of structure on properties. 56 ref.

4D-32. Oriented Arrangements of Thin Aluminum Films on Ionic Substrates. T. N. Rhodin, Jr. *Journal of Metals*, v. 1, sec. 3, June 1949 (*Metal Transactions*, v. 185), p. 371-382.

Procedure and apparatus for forming and examining. Structure of films condensed in vacuum on clean ionic substrates is strongly influenced by the nature, geometry, and temperature of ions in the base. Degree of orientation with respect to the base can be semiquantitatively correlated with a binding energy characteristic of the substrate. 15 ref.

4D-33. The Effect of Rolling and Annealing Procedures on the Structure and Grain-Size of Aluminium-Copper-Magnesium Alloy Strip. R. Chadwick, T. Ll. Richards, and K. G. Sumner. *Journal of the Institute of Metals*, v. 75, Apr. 1949, p. 627-640.

Results, including effect on mechanical properties. The alloy contained 4.26% Cu, 0.79% Mg, 0.63% Mn, 0.41% Fe, 0.38% Si, 0.01% Ti, and traces of Zn and Ni.

4D-34. Brillouin Zone Effects in Aluminium Alloys. E. C. Ellwood. *Nature*, v. 163, May 14, 1949, p. 772.

It was found by density measurements at 283 and 318° C. that a defect lattice of the type reported by Bradley and Taylor is formed, there being 5.6% vacant lattice sites at 16.5 atomic % Zn (assuming that the pure aluminum used as a standard contained no vacant lattice sites) and less than 0.5% vacant sites at 25 atomic % Zn.

4D-35. Analyse par micrographie et par rayons X d'une nouvelle texture basaltique de solidification de lingots d'aluminium. (Analysis, by Means of Micrography and X-Rays, of a New "Basaltic" Structure in Aluminum Ingots.) Jean Herenguel and Paul Lacombe. *Comptes Rendus*, v. 228, Mar. 7, 1949, p. 846-848.

A new crystal structure obtained by semicontinuous casting. This structure appears in the form of elongated crystalline fibers, direction of which is nearly parallel to the axis of the ingot. Examination of other sections of the billet showed that, in reality, these fibers consist of an aggregation of flat scale-like crystals.

4D-36. Beitrag zur Untersuchung von Vierstofflegierungen. (Research on Quaternary Alloys.) Angelica Schrader. *Metall*, Apr. 1949, p. 110-115.

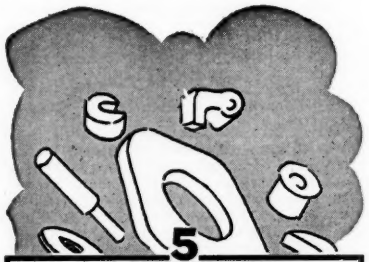
The aluminum corners of the Al-Cu-Mg-Si and Al-Fe-Mg-Si systems.

4D-37. Gefugebeobachtungen bei der Erstarrung von Aluminium-Siliziumund Aluminium-Kupfer-Magnesium-Legierungen. (Structure Observations on Solidifying Aluminum-Silicon and Aluminum-Copper-Magnesium Alloys.) Maria and August Buckeley. *Die Neue Giesserei*, v. 36 (new ser., v. 2), Apr. 1949, p. 99-103.

Microstructures of Al-Si, Al-Si-Mg, and Al-Cu-Mg alloys quenched from different stages of solidification.

For additional annotations indexed in other sections, see:

3B-120-123-125; 3C-120; 11-177; 18B-91



5A—General

5A-32. Die theoretischen Grundlagen der Frittungsvorgänge innerhalb von Pulvern. (Theoretical Basis of the Process of Sintering of Powders.) G. F. Huttig. *Archiv fur Metallkunde*, v. 2, Mar. 1948, p. 93-99.

A theory of the sintering action of powders by studying the behavior of an isolated crystal; also the behavior of two or more similar crystals in contact with each other with increasing temperature. The theo-

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ries developed are based mainly on experiments with metal oxides. 24 ref.

5A-33. Schwindung und Quellung beim Sintern von Metallen. (Shrinkage and Swelling in the Sintering of Metals.) K. May. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 154-163.

An experimental study of the factors (grain size, pressure, temperature, and phase transformations) affecting the above in pure metals and alloys. The theory and mechanism of compression swelling in Fe-Zn and Fe-C alloys are explained. 14 ref.

5A-34. Problems of Pressing Metal Powders. H. W. Greenwood. *Machinery* (London), v. 74, May 26, 1949, p. 696-697.

Including work hardening by ball milling or vigorous mechanical screening, and infiltration techniques—production of porous objects with the pores filled with a low-melting-point metal.

5A-35. Recent Developments in Powder Metallurgy. Supplement to "Powder Metallurgy—Its Physics and Production." Part II. Products. Paul Schwarzkopf. *Powder Metallurgy Bulletin,* v. 4, May 1949, p. 64-111.

Comprehensive review. 300 ref.

5A-36. Report of Committee B-9 on Metal Powders and Metal Powder Products. *American Society for Testing Materials,* Preprint 16, 1949, 7 pages.

Includes proposed tentative definitions of terms used in powder metallurgy.

5A-37. A Compressibility Test for Metal Powders. F. V. Lenel. *ASTM Bulletin,* May 1949, p. 52-56.

Influence of various lubricants on compressibility of three copper and three iron powders was determined in a cooperative test program.

5A-38. Beeinflussung des Schwundes durch Zugkräfte beim Sintern von Metallpulvern. (Influencing Shrinkage by Application of Tensile Stress During Sintering of Metal Powders.) Walther Dawihl and Walter Rix. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 115-117.

Application of a load of as little as 25 g. per sq. mm. is almost sufficient to eliminate shrinkage in the longitudinal direction, while shrinkage is being intensified normal to the direction of application of tensile stress. Apparatus used. Results of application to cobalt powder compacts.

5B—Ferrous

5B-13. Der Stand der Fertigungstechnik in der Pulvermetallurgie des Eisens. (The Status of Production Technique in the Powder Metallurgy of Iron.) H. Timmerbeil and O. H. Hummel. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 30-35.

Production and properties (hardness, wear resistance, weldability, and workability) of sintered metal parts. Applications. 12 ref.

5B-14. Betrachtungen zum Reaktionsverlauf des Sinterungsvorganges von Eisenpulver. (Observations on the Process of Sintering of Iron Powder.) H. Bernstorff. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 103-106.

Production of metal powders by centrifugal process; sieve analysis, composition, and mechanical properties of the test powder; effect of sintering conditions on mechanical properties and structure; and reaction mechanism involved. 13 ref.

5B-15. Uber Zusammenhänge zwischen Herstellungsverfahren von Eisenpulvern und der Kristallhärte. (Relationship Between Methods for Production of Iron Powders and Hardness of the Sintered Bodies.) Walther Dawihl and Ursula Schmidt. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 117-119.

Hardness is greatly affected by the production method.

5B-16. Die heutigen Verfahren zur Herstellung von Eisenpulver, ihre Rohstoffgrundlagen und Wirtschaftlichkeit. (Modern Methods of Producing Iron Powders; Basic Raw Materials; and Economics.) Herbert Buchholtz. *Stahl und Eisen,* v. 69, Apr. 14, 1949, p. 247-256.

The most important methods and their technical and economic advantages and disadvantages. 15 ref.

5C—Nonferrous

5C-11. Sintering Carbides by Means of Fugitive Binders. Lawrence S. Foster. *U. S. Atomic Energy Commission,* AECD-2464, Jan. 28, 1949, 35 pages.

Development of method for production of pure WC, CbC, and TaC having zero surface-connected porosity and nearly the theoretical density. This was done by grinding the carbides to a very fine particle size, admixing only a very small amount of binder (for example, less than 0.5% Co), sintering, and distilling off the binder metal by heating in vacuum. Ni and oxides of Co and Ni were also used as binders. Properties and structures of the products.

5C-12. Magnetische und elektrische Untersuchungen an gesinterten Karbonylnickelstäben. (Magnetic and Electrical Research on Sintered Carbonyl Nickel Bars.) Walther Gerlach, Jakoba von Rennenkampff, and Alexander Brill. *Zeitschrift fur Metallkunde,* v. 39, May 1938, p. 130-139.

Specific magnetization, hysteresis, remanence, coercive force, and demagnetization factor in the range between −195° C. and the Curie point. Also the density and the specific electrical resistance and the effect of oxygen, cooling rate, surface oxidation on these properties. Several X-ray analyses of the crystal structures.

6A—General

6A-61. Radioactive Tracers Used in Corrosion Studies. C. G. Bacon. *General Electric Review,* v. 52, May 1949, p. 7-9.

Procedure used at G. E.

6A-62. Investigation of Electrode Reactions by the Method of Charging-Curves and With the Aid of Alternating Currents. B. Ershler. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 269-277; discussion, p. 298-302.

Method and results obtained by its use with respect to: kinetics of the formation of adsorbed layers of oxygen and hydrogen on metals and of the dissolution of metals; and of the mechanism of anodic dissolution and passivation of platinum. 21 ref.

6A-63. The Use of Silver-Silver Chloride Reference Electrodes in Dilute Solutions. P. T. Gilbert. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 320-325; discussion, p. 325-328.

The Ag/AgCl electrode is suitable for use in corrosion work at temperatures up to at least 85° C. and in dilute solutions containing as little as 10 p.p.m. chloride. Desirability in corrosion studies of being able to compare directly potentials measured at different temperatures. Basis on which such comparisons may be possible.

6A-64. Corrosion Problems of the Automotive Engineer. F. L. LaQue and E. J. Hergenroether. *Society of Automotive Engineers,* Preprint No. 337, 1949, 24 pages.

Problem at temperatures not far above atmospheric and only as it occurs after manufacture has been completed. This leaves out corrosion of valves by hot exhaust gases, corrosion in the shop, etc. 23 ref.

6A-65. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 41, June 1949, p. 97A-98A.

Large increase in university research and teaching in the field of corrosion during recent years.

6A-66. Influence de l'humidité relative et de l'état de surface sur la corrosion de l'acier a faible teneur en carbone et du zinc. (Influence of the Relative Humidity and Surface Condition on the Corrosion of Low-Carbon Steels and Zinc.) Fielding Ogburn, Elmer R. Weaver, and William Blum. *Metaux & Corrosion,* v. 24, Mar. 1949, p. 77-84.

Results of experiments using a constant-humidity chamber. Recommendations for minimizing such corrosion.

6A-67. Ein Verfahren zur Prufung des Korrosionswiderstandes unter veränderlicher Biegespannung. (A Method of Testing Corrosion Resistance Under Variable Bending Stress.) H. J. Seemann. *Metalloberfläche,* v. 3, sec. A, Apr. 1949, p. 85-86.

Simple setup.

6B—Ferrous

6B-84. Fatty Acids Versus Construction Materials. *Chemical Engineering,* v. 56, May 1949, p. 263-264, 266.

Part II of a symposium in which a representative group of construction materials are evaluated for services involving fatty acids. Consists of the following: "Rubber Lining", O. S. True; "Porcelain", John S. Chowning; "Chlorimet", Walter A. Luce; "Iron and Steel", A. W. Spitz; and "Worthite", W. E. Pratt.

6B-85. Kinetics of Electrode Processes on the Iron Electrode. B. Kabanov, R. Burstein, and A. Frumkin. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 259-269; discussion, p. 298-302.

The following were studied on the basis of the literature and new data: influence of an oxide film on the anodic passivation of iron in alkaline solutions; mechanism of the dissolution and passivation of iron in alkaline solution; the electrochemical process at potentials of about 0.95 v; and anodic oxidation of iron in the presence of chlorine ions. A mechanism to explain the relationship between the formation of $Fe(OH)_2$ and the passivation of iron upon anodic oxidation. The

mechanism of the anodic dissolution of iron in the presence of both chlorine and hydroxyl ions. 28 ref.

6B-86. Erkenntnisse uber das Rosten und den Rostschutz von Eisen und Stahl (1944 bis 1945). (Corrosion and Its Prevention on Iron and Steel (1944-1945).) (Concluded.) Heinrich Steinrath and Karl-Friedrich Mewes. *Stahl und Eisen,* v. 66-67, June 19, 1947, p. 229-231.

A review. 197 ref.

6B-87. Redoxsysteme als Korrosionsschutzmittel fur Metalle gegen Angriffe durch Wasser-in-öl-Emulsionen. (Redox Systems as Preventives of the Corrosion of Metals by Water-in-Oil Emulsions.) J. Reitstötter and J. Rzymkowski. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 9-12.

Results of a study of theoretical relationships between the potential of rusting iron and the required potential or rH value (defined) of an oxidative protective agent. Recommends certain redox systems for metal containers that are used for storing water emulsions.

6B-88. Die Wirkung von Zusätzen zur Beizsäure. (The Effect of Additions to Pickling Acids.) K. Wickert. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 56-62.

Results of experimental studies on the effect of inhibitors and accelerators in the pickling of steel.

6B-89. Beizversuche mit Zink- und verzinkten, verrosteten Eisenblechen. (Pickling Experiments With Sheet Zinc and Zinc-Plated but Partly Rusted Sheet Iron.) W. Machu. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 62-69.

The solubility of Zn of 99.9% and 99.4% purity in inhibitor-containing dilute H_2SO_4 and in other acids, and also the behavior of Zn in cathodic pickling solutions. The effects of acid mixtures and of organic acids.

6B-90. Beitrag zur Einwirkung von HNO_3 konz. auf Ferro-Siliziumuberzuge bei Stahl. (The Effect of Concentrated HNO_3 on Coatings of Ferrosilicon on Steel.) Friedrich Erdmann-Jesnitzer. *Metall,* Aug. 1948, p. 264-265.

To protect the welded seams of structural steel from excessive normal and stress corrosion, it was proposed that they be coated with ferrosilicon. Effects of concentrated HNO_3 show that, to be effective, the coatings must be applied so that the layer forms a homogeneous structure of Fe-Si solid solution crystals.

6B-91. Cathodic Protection of Steel in Various Chemical Solutions, Using Magnesium, Zinc, and Zinc-Lithium Anodes. R. R. Rogers and W. R. G. Stewart. *Canadian Mining and Metallurgical Bulletin,* v. 42 (*Transactions of the Canadian Institute of Mining and Metallurgy,* v. 52), May 1949, p. 218-221.

Results of experimental investigation.

6B-92. Corrosion of Electroplated Steel in Automotive Applications. H. A. Pray. *Society of Automotive Engineers,* Preprint No. 338, 1949, 12 pages.

Purpose of the study was to determine relative usefulness of various composite Cu-Ni-Cr deposits as protective and decorative coatings on high-carbon steel in various typical atmospheres.

6B-93. The Adsorption of Organic Corrosion Inhibitors on Iron and Steel Surfaces: Electron Diffraction Studies. Norman Hackerman and Harold R. Schmidt. *Journal of Physical & Colloid Chemistry,* v. 53, May 1949, p. 629-638.

Use of electron-diffraction to detect adsorption of polar organic compounds on metal surfaces. It is shown that the firmness of adherence can be judged by a relatively simple procedure. A direct observation and measurement of orientation rate was made. 16 ref.

6B-94. Electrolytic Corrosion of Underground Pipes. Leslie T. Minchin. *Coke and Gas,* v. 11, May 1949, p. 153-156, 165.

Some modern methods of prevention with particular reference to Belgian practice.

6B-95. Oxide Films Formed on Pure Iron in Concentrated Hydrochloric Acid. W. I. Whitton. *Nature,* v. 163, May 14, 1949, p. 763-764.

It was found that treatment of specimens of enameling iron in hot dilute HCl gave fairly reproducible corrosion-rates. Treatment in cold concentrated HCl reduced the corrosion rate to approximately 1½ times less than the rate after treatment in the dilute acid. Reason for this retardation was found to be presence of an oxide film. Possible mechanisms.

6B-96. The Atmospheric Corrosion of Iron and Steel Wires. J. C. Hudson. *Wire Industry,* v. 16, Apr. 1949, p. 333-335, 337; May 1949, p. 417-419.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 6b-151, 1948.

6B-97. La corrosion superficielle dans le circuit de lavage des charbonnages des mines de l'état néerlandais. (Surface Corrosion in the Circuit for Coal Washing of the Netherlands State Mines.) H. G. Zelders. *Metaux & Corrosion,* v. 24, Mar. 1949, p. 65-76; discussion, p. 76.

Attack on iron tanks found to be caused by a combination of corrosion caused by oxygen dissolved in the water and by erosion. Practical solution.

6B-98. Uber den Einfluss von Kolloiden auf die Korrosion durch Wasser in Warmwasserversorgungs- und Heizungsanlagen. (The Effect of Colloids on the Corrosiveness of Water in Hot Water Supply and Heating Plants.) W. Machu. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 71-76.

The effects of water-glass solutions, gelatins, agar-agar, starch, and other colloidal solutions on corrosion of soft iron at 60° C.

6B-99. Zum atmosphärischen Rosten des Eisens. (Atmospheric Rusting of Iron.) G. Schikorr. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 76-79.

Results of a study under different atmospheric conditions over a 5-yr. period.

6B-100. Pekanie miekkiej stali pod wplywem korozji miedzykrystalicznej w roztworach azotanu amonowego. (Crack Formation in Mild Steel Under the Influence of Intercrystalline Corrosion Caused by Ammonium Nitrate.) M. Smialowski, B. Kopec, and J. Michalik. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 1-12.

Investigated using metallographic, crystallographic, chemical, and mechanical methods. Results indicate that the phenomenon is of great complexity depending on a series of factors other than the formation of iron nitrate, in contradiction to the theory of Waber and McDonald. 10 ref.

6C—Nonferrous

6C-35. The Testing of Metal Alloys at High Temperatures. C. L. Beuken and R. Czepek. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 256-262; discussion, p. 347-366.

Use of thermobalance method for determining oxidation resistance of metals at high temperatures. Test results on eight alloys, partly Cr-Ni and partly Cr-Fe-Al, are compared with those of standardized life-tests.

6C-36. Uber eine hochaluminiumhaltige Zinklegierung. V. Verhalten bei Einwirkung von Säuren. (A High-Aluminum Zinc Alloy. V. Behavior in Contact With Acids.) Erich Gebhardt. *Zeitschrift fur Metallkunde,* v. 39, May 1948, p. 142-144.

Corrosion resistance of 32% Al, 3% Cu alloy with respect to acetic, sulfuric, nitric, and hydrochloric acids of varying concentration.

6C-37. Die Oxydationsgeschwindigkeit von Nickel. (The Rate of Oxidation of Nickel.) Oswald Kubaschewski and Ortrud v. Goldbeck. *Zeitschrift fur Metallkunde,* v. 39, May 1948, p. 158-160.

The author compares his results with those obtained by others. An effect of the purity of the nickel on its resistance to oxidation, and the probable effect of temperature on oxidation rate.

6C-38. Report of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys. *American Society for Testing Materials,* Preprint 10, 1949, 26 pages.

Includes proposed revised tentative method of salt-spray (fog) testing (with appendix on design of apparatus); and paper, "Effect of Weather on the Initial Corrosion Rate of Sheet Zinc", by O. B. Ellis.

6C-39. Die Korrosion von Kupfer in technischen Salzlösungen. (The Corrosion of Copper in Commercial Salt Solutions.) W. Katz. *Metalloberfläche,* ser. A, v. 3, May 1949, p. 101-105.

The corrosion of Cu in solutions of $MgCl_2$, $MgSO_4$, HCl, and NaCl. In alkaline buffered solutions (not necessarily above pH 7), the Cu dissolves at a constant rate, whereas, in slightly acid solutions, it dissolves at an increasing rate.

6C-40. Metallic Alloys Stable in Hydrochloric Acid Media. (In Russian.) N. I. Gel'perin, Yu. P. Aronson, D. I. Drukarova, and T. S. Raitsina. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Jan. 1949, p. 45-55.

Use of "Hastelloy" A and B Ni-Mo alloys for construction of equipment for treatment of substances containing HCl, HBr, and HCOOH. Effects of exposure to these chemicals over a range of concentrations and temperatures.

6C-41. Investigation of the Corrosion of Galvanized Roofing Iron During Contact With Wet Construction Materials: Soil, Clay, and Sand. (In Russian.) A. V. Solov'ev. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Jan. 1949, p. 62-66.

Experimental data.

6C-42. Beständigkeit von Silber gegen Flusssäure. (Resistance of Silver to Hydrofluoric Acid.) Martha Gretchman and K. W. Fröhlich. *Chemie-Ingenieur-Technik,* v. 21, Feb. 1949, p. 68.

Results of experiments at temperatures of 18-115° C.

6C-43. (Book) **Panel Discussion on Influence of Non-Ferrous Metals and Their Compounds on Corrosion of Pressure Vessels.** American Society for Testing Materials, 1916 Race St., Philadelphia, Pa., 1949, 45 pages. $1.00.

Effect on corrosion of the deposition as sludges, or as metals, of nonferrous metals and their compounds in pressure vessels. Consists of two papers: "Station Design and Mate-

rial Composition as Factors in Boiler Corrosion", R. B. Conworth; and "Corrosion of High-Pressure Steam Generators: Status of Our Knowledge of the Effect of Copper and Iron Oxide Deposits in Steam Generating Tubes", Richard C. Corey.

6D—Light Metals

6D-19. Resistance of Magnesium Alloys to Corrosion. *Magazine of Magnesium*, May 1949, p. 13.

Qualitative ratings for the various alloys with respect to indoor and outdoor atmospheres and sea water.

6D-20. Uber den Einfluss verschiedener Legierungszusätze auf die Spannungskorrosionbeständikeit von Aluminium - Zink - Magnesium - Legierungen mit 4, 5% Zn und 3, 5% Mg. (The Effect of Different Alloying Additions on the Resistance of Aluminum-Zinc-Magnesium Alloys With 4.5% Zn and 3.5% Mg to Stress Corrosion.) Walter Bungardt. *Zeitschrift fur Metallkunde*, v. 39, Aug. 1948, p. 247-253.

Effect of Cu, Mn, V, Fe, and Si. Alloy compositions and test conditions. 18 ref.

6D-21. Service Tests Solve Aluminum Cylinder Head Corrosion Problems. M. W. Daugherty and R. F. Koenig. *Society of Automotive Engineers*, Preprint No. 339, 1949, 16 pages.

Cause of and method of preventing corrosion.

6D-22. Processes of Drop Corrosion of Aluminum. I. Corrosion of Aluminum in Contact With Droplets of Solutions of Salt Without Additions of Free Acid. (In Russian.) I. V. Krotov and T. M. Khachadurova. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), Jan.-Feb. 1949, p. 18-26.

Investigated using Cu and Ag salts. The characteristic role of the oxygen in the air in relation to these processes. Experimental results from the thermodynamic point of view.

For additional annotations indexed in other sections, see:

3B-120: 3C-120: 7A-81

7A—General

7A-73. Description, Design and Production Costs of a Conveyorized Spray Finishing System. E. Paul Schwartz. *Proceedings, American Electroplaters' Society*, v. 25, 1949, p. 291-302; discussion, p. 302-304.

System designed for finishing of typewriter parts. The base metals are sheet steel, cast iron, and die-cast aluminum.

7A-74. Some Aspects of Deburring and Polishing in Barrels. Hans Weiss. *Electroplating and Metal Finishing*, v. 2, May 1949, p. 349-353; discussion, p. 353-354.

7A-75. Die Sulfohalogenide in der Oberflächenveredlung. (Use of Sulfohalides for Cleaning of Surfaces.) A. Kufferath. *Archiv fur Metallkunde*, v. 2, Feb. 1948, p. 69-70.

Chemistry of sulfohalides (general formula, RSO_2X) and their use as metal-cleaning agents.

7A-76. Surface Preparation for Metallizing. Rick Mansell. *Steel Processing*, v. 35, May 1949, p. 241-244, 267.

Various methods: machining; blasting; electrical bonding (conventional and Fusebond); and the Sprabond Process, in which a special metal is applied directly, even to polished surfaces, by spraying, forming a base for the desired metal.

7A-77. Application of the Radioactive Tracer Technique to Metal Cleaning. J. C. Harris, R. E. Kamp, and W. H. Yanko. *ASTM Bulletin*, May 1949, p. 49-52.

Details of new procedure. Carbon 14 was incorporated by chemical synthesis in N,N-di-n-butyl stearamide, and the latter dissolved in SAE 60 oil, which was applied as a coating to sample pans made of surface-hardened sheet steel and stainless steel. G.M. counts after each of a series of standardized detergent washes. The method is more sensitive than existing methods and is quantitative in character.

7A-78. Vapor Blasting Precision Parts. *Steel*, v. 124, June 13, 1949, p. 104.

Steel parts for diesel-fuel-injection pumps are deburred quickly and effectively, using air under 100 psi. pressure and a water-grit mixture, in a rubber-lined barrel.

7A-79. Coloring of Metals. N. Bruce Bagger. *Materials & Methods*, v. 29, June 1949, p. 67-82.

Introduction plus sections on iron and steel; Cu and its alloys; Cd and Zn; Al; Mg; and the final finishing operation. Typical methods.

7A-80. Maintenance by Metallizing. John E. Wakefield. *Welding Engineer*, v. 34, June 1949, p. 24-28.

Metallizing gun units which spray over 30 different kinds of metal and can apply various coating to almost any kind of base material. Methods of preparing the base material and coating procedures for various parts.

7A-81. The Mechanisms of Some Elementary Surface Reactions. Keith J. Laidler. *Journal of Physical & Colloid Chemistry*, v. 53, May 1949, p. 712-732.

Basic rate and equilibrium equations for adsorption and desorption processes are developed in a somewhat different manner from previously. The treatment is then extended to the production and recombination of atoms and free radicals at surfaces, important in connection with free-radical and overvoltage mechanisms. Also, adsorption with surface penetration. 26 ref.

7B—Ferrous

7B-93. Influence of Zinc on the Welding and Heat Treating of 18-8 Stainless Steel (Type EYalT). (In Russian.) F. E. Tret'yakov. *Avtogennoe Delo* (Welding), Dec. 1948, p. 12.

Cracks which appeared during heat treatment of welded parts of 18-8, processed in Pb-Zn alloy dies. Cause was found to be related to the presence of Zn from the dies on the surface of the parts. Pickling solution and practice developed for removal of the Zn prior to welding.

7B-94. The Importance of Acid Ratio in Phosphatization of Steel. Nelson F. Murphy and Michael A. Streicher. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 281-289; discussion, p. 289-290.

The function of the above. It is shown that the ratio may be more accurately determined by using bromphenol blue indicator for free-acid titration, and that the pH of the phosphatizing solution is a function of the ratio for the concentrations studied. Factors affected.

7B-95. Palm Oil Substitutes for Hot Dip Tinning. W. R. Johnson, L. C. Kinney, and John M. Parks. *American Iron and Steel Institute*, Preprint, 1949, 19 pages.

Requirements and tests of tinning oils. Experimental procedure and results.

7B-96. Painting Bicycle Rims. J. Farkas. *Industrial Finishing*, v. 25, May 1949, p. 30-31, 33-34.

Procedures and equipment.

7B-97. Corrosion Protection for Offshore Drilling Structures. Arthur E. Burns, Jr. *Oil and Gas Journal*, v. 48, May 19, 1949, p. 241, 243.

Recommendations for prevention of marine-organism fouling as well as corrosion, by use of various coating materials. Three fundamentally different areas of exposure must be considered: continuously submerged; intermittently submerged; and never submerged.

7B-98. Der Schutzwert von Beizinhibitoren und seine Beurteilung. (The Protective Value of Pickling Inhibitors and Their Evaluation.) I. H. Fischer. *Archiv fur Metallkunde*, v. 2, Jan. 1948, p. 1-9.

Report on laboratory work on the chemical removal of rust and scale from iron and steel. Results are compared with those of tests made on an industrial scale.

7B-99. Der Schutz des Eisens durch thermisch erzeugte oxydische Bedeckungsschichten (Thermoxydverfahren). [The Protection of Iron by Thermally Produced Oxide Films (Thermo-Oxide Process).] E. Fenner and L. Koch. *Archiv fur Metallkunde*, v. 2, Feb. 1948, p. 53-56.

Process has the advantage of not requiring any scarce metals, chemicals, and equipment. Its effectiveness is shown by comparative corrosion tests. The oxide film is hard, brittle, and resistant to abrasion.

7B-100. Uber die Wirkung von Schutzstoffen beim Beizen. (The Effect of Inhibitors in Pickling.) K. Wickert. *Archiv fur Metallkunde*, v. 2, Oct. 7, 1948, p. 137-139.

A method of determining, with 1:1 and 1:4 HCl, the nature of the passivating effect of the inhibitor on the metal surface. The accelerating effect of NaCl.

7B-101. Prufung des Korrosionsschutzes nichtleitender Lackschichten bei Konservendosen. (Determining the Protective Effect of Nonconducting Lacquer Films on the Corrosion of Tin Cans.) K. Mehnert. *Archiv fur Metallkunde*, v. 2, Oct. 7, 1948, p. 140-144.

A simple method. Resistance is measured by means of an a.c. bridge and porosity is calculated from the resistance. Typical data are tabulated and charted.

7B-102. The Prevention of Metallic Corrosion. *Machinery Lloyd* (Overseas Edition), v. 21, May 21, 1949, p. 94-97.

Advantages of double and triple treatments for the above, especially those in which phosphate is followed by stain and oil, or by chromate and stain or oil.

7B-103. Abrasive Belts Finish Parts

Faster. William F. Stoeffhaas. *American Machinist,* v. 93, June 2, 1949, p. 94-95.

Increased production and lower costs result from use of abrasive belts for grinding and polishing bicycle parts.

7B-104. Machine Scarfing of Steel. O. K. Sharp. *Iron and Steel Engineer,* v. 26, May 1949, p. 53-56; discussion, p. 56-58.

Also known as desurfacing or flame scarfing. Removal of surface defects by means of multiple oxygen-acetylene torches, during some stage of the rolling operation, while the slab, bloom, or billet is still at a rollable temperature. Equipment and procedures.

7B-105. Rust Preventives Help Maintain Steel Structures. J. G. Surchek. *Iron and Steel Engineer,* v. 26, May, 1949, p. 82-85.

Some applications of petroleum-base coatings used by industry for protection of steel structures.

7B-106. Special Phosphate Coating Treatment Ups Output of Cold Drawn Tubing. *Steel,* v. 124, June 6, 1949, p. 118.

7B-107. The Effects of Metallizing Procedures on the Fatigue Properties of Steel. W. Lee Williams. *American Society for Testing Materials,* Preprint 20, 1949, 18 pages.

The four conventional methods of surface roughening, namely, electric bonding, grit blasting, rough threading, and grooving and knurling. The use of shot peening in conjunction with electric bonding. Reasons for reductions in fatigue strength and the way in which these are related to the size of the tested section. 22 ref.

7B-108. How to Clean Ferrous Metal Parts. Rick Mansell. *Machinery,* v. 55, June 1949, p. 194-196.

Use of solvent cleaners, steam-cleaning equipment, phosphoric-acid cleaners, vapor-degreasing equipment, and alkaline cleaners.

7B-109. Body Finishing by Fisher. Ezra A. Blount. *Products Finishing,* v. 13, June 1949, p. 54-56, 58, 60, 62, 64.

Body assembly using spot and torch welding. Metal finishing, rust-proofing, glazing final coating, and polishing operations.

7B-110. A Study of Paints for Enclosed Structural Members in Steel Housing Construction. H. A. Pray and R. S. Peoples. *American Iron and Steel Institute,* Preprint, 1949, 46 pages.

Some 34 kinds of paint systems were studied in contact with such conditions as continuous water immersion, high humidity, continuous condensation, alternate wet-dry conditions, and continuous contact with insulation in the presence of water. 15 ref.

7B-111. Fabrication, Metal Preparation, Enameling—Sinks, Bathtubs and Washing Machine Tubs. Frank Osborne. *Finish,* v. 6, June 1949, p. 19-23, 78.

Plant routine and picture story of sink and bathtub production.

7B-112. Die Entwicklung und Anwendung der Atramentverfahren unter den heutigen Wirtschaftsbedingungen. (Development and Uses of the "Atrament" Processes Under Present-Day Economic Conditions.) F. Rossteutscher. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 66-71.

Various phosphating methods, with emphasis on I.G.'s "Atrament" processes. 17 ref.

7B-113. Uber die Witterungsbeständigkeit von kaltphosphatiertem Stahl. (The Weathering Resistance of Cold-Phosphated Steel.) G. Schikorr. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 82-83.

The effect of cold phosphating and subsequent treatment with oil or oil emulsions on the resistance of steel to sea-water spray and to atmospheric conditions.

7B-114. Beizen, Atzen, Vorbehandeln, Entrosten und Rostschutzmittel. (Pickling, Etching, Pretreating, Rust Removal, and Rust Preventives.) III and VI. (Concluded.) Richard Springer. *Metalloberfläche,* v. 2, Oct. 1948, p. 224-229; v. 3, sec. A, Apr. 1949, p. 96-99.

Two more installments of literature and patent review covering 1935-43.

7B-115. Die Oberflächenrostung, eine neue Vorbehandlung von Eisenoberflächen zum Lackieren. (Surface Oxidation, A New Treatment for Iron Surfaces Prior to Lacquering.) H. Ketterl. *Metalloberfläche,* v. 3, Mar. 1949, p. 72-73.

A new method in which suitable pickling and rinsing, followed by dehydration, will result in production of an oxide that forms an excellent base for lacquer and other protective coatings.

7B-116. Zur Theorie und Praxis des Feuerverzinkens. (The Theory and Practice of Hot Galvanizing.) Heinz Bablik. *Metalloberfläche,* ser. A, v. 3, May 1949, p. 105-110.

The reactions of fluxes in the zinc bath, structures of galvanic deposits, alloying additions to the zinc bath, the Pb-Zn process, and corrosion of hot-galvanized vessels by hog feed.

7C—Nonferrous

7C-26. Hot Dip Tinning Zinc Die Castings. Hiram K. Barton. *Die Castings,* v. 7, June 1949, p. 43-44, 46, 58.

Permits use in food or beverage-handling equipment. Details of production tinning, together with recommendations for application.

7C-27. Electron-Microscopic Investigation of Structural Changes of Highly Dispersed Solid Bodies During Heating. (In Russian.) A. I. Ecneistova and A. B. Shekhter. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), Jan.-Feb. 1949, p. 13-17.

Method was applied to investigation of "smoke" surface films of ZnO, MgO, Au and Ag during heating in air. It was found that the initial "lacy" structure of these smoke films changes into a denser, more compact structure during heating, as is shown by means of electron micrographs. This fact indicates high mobility for the atoms in the surface layer caused by heating to a certain temperature.

7D—Light Metals

7D-27. A New Pretreatment Process for Light Alloys: The Application of "Alocrom" to Wash Boiler Production. R. E. Shaw. *Sheet Metal Industries,* v. 26, May 1949, p. 1031-1034, 1036.

Use of this chemical surface treatment prior to painting Al-alloy washing-machine tubs. Test-panel photographs show comparative resistances to boiling soap solutions and to soaking plus abrasion of painted surfaces pretreated with degreasing solvent, alkali chromate, and Alocrom.

7D-28. Fundamentals in the Finishing of Magnesium. *Magazine of Magnesium,* May 1949, p. 2-5.

7D-29. Die Herstellung und Verwendung von hitzebeständigen Aluminiumuberzugen. (The Production and Use of Heat-Resistant Aluminum Coatings.) Gottfried Kremer and Karl Erich Volk. *Stahl und Eisen,* v. 66-67, July 17, 1947, p. 250-255; discussion, p. 255-257.

Results of a study of the appearance and corrosion-resistant properties of different aluminum coatings on alloyed, unalloyed, and cast steel, as well as on cast iron. 12 ref.

7D-30. Uber die chemische Erzeugung einer dickeren Magnesiumfluorid-Schutzschicht auf Magnesium-Legierungen. (The Chemical Production of a Heavier Protective Film of Magnesium Fluoride on Magnesium Alloys.) M. Staesche. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 99-102.

A primary film of magnesium hydroxide is applied by means of NaOH to the magnesium and converted, by boiling in fluoride solutions, into magnesium fluoride. 30-day tests in oxygen-containing sea water proved that the samples thus treated were highly resistant to corrosion.

7D-31. Four Finishes on Die Cast Aluminum: Bright Chrome; Satin Chrome; Bronze Wrinkle; Die Cut Inset. *Die Castings,* v. 7, June 1949, p. 23-24, 61-62.

Use on 16-mm. movie cameras. Design of parts.

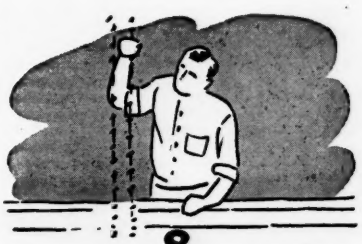
7D-32. Surface Finishing and Protection of Magnesium Alloys. H. K. DeLong. *Products Finishing,* v. 13, June 1949, p. 72, 74, 76, 78, 80, 82, 84, 86, 88, 90.

Operational procedure. Surface conversion coatings by chemical dipping and anodic oxidation, painting, and electroplating.

7D-33. New Vinyl Resin-Phosphate Primer for Aluminum. *Products Finishing,* v. 13, June 1949, p. 106, 108, 110.

For additional annotations indexed in other sections, see:

3C-116; 6B-90; 8-139; 15-43; 24C-7



8

ELECTRODEPOSITION and ELECTROFINISHING

8-126. Physical Properties of Electrodeposited Metals—Nickel. Abner Brenner and Charles W. Jennings. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 31-50; discussion, p. 50-51.

Previously abstracted from *Plating,* item 8-276, 1948.

8-127. A Spiral Contractometer for Measuring Stress in Electrodeposits. Abner Brenner and Seymour Senderoff. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 53-76; discussion, p. 76-78.

Previously abstracted from *Journal of Research of the National Bureau of Standards,* item 8-80, 1948.

8-128. Methods for Testing Thickness of Electrodeposits. Effect of Internal Stress on Thickness Determinations by the Jet Method. Harold J. Read and J. Howard Thompson. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 79-85; discussion, p. 85-86.

Evidence presented indicates that at least one chemical-rate method

of determining thickness is subject to errors due to internal stress and other but unknown physical properties of the deposit. Results emphasize the need for determining for each particular set of conditions under which work may be plated the factor which is to be used for conversion of penetration time to thickness.

8-129. Judging the Quality of Plated Parts. W. M. Phillips and F. L. Clifton. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 87-102; discussion, p. 102-104.

Confined largely to tests on parts plated for decorative use, particularly those finished with chromium.

8-130. Porosity of Electrodeposited Metals. Measurement of Intrinsic Porosity. N. Thon and Denis Kelemen. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 105-113; discussion, p. 114-118.

Previously abstracted from *Plating*, item 8-203, 1948.

8-131. Effect of Impurities and Purification of Electroplating Solutions. Some Effects of Copper in Nickel Plating Solutions on the Salt Spray Resistance of Nickel and Nickel-Chromium Deposits on Steel. D. T. Ewing, Robert Rominski, and William King. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 119-122; discussion, p. 122-124.

Previously abstracted from *Plating*, item 8-237, 1949.

8-132. Re-Oxidation of Trivalent Chromium in Chromic Acid Plating Baths. R. Seegmiller and V. A. Lamb. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 125-130; discussion, p. 131-132.

Results of quantitative and qualitative experiments made to determine the effect of sulfate content on the net reoxidation of trivalent to hexavalent chromium and also to define the conditions favorable to this oxidation. Practical application to plating problems.

8-133. Bright Barrel Plating of Nickel and Zinc. Leonard A. Chesworth. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 133-140; discussion, p. 140-141.

Requirements and recommended procedures.

8-134. Plating High Copper-Zinc Alloys. A. Kenneth Graham. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 143-156; discussion, p. 156.

Electrodeposition of so-called "copper bronzes", containing 85-95% Cu, has been used to produce deposits matching the color of cast or rolled "bronze" alloys of Cu-Sn or Cu-Zn. It has been confined largely to the coloring of steel-base hardware, lighting fixtures, and novelties. Experimental results showing effects of pH, ammonia, current density, temperature, copper concentration, agitation. Recommendations.

8-135. The Deposition of Metals on Plastics Employing Reduced Copper Films. Harold Narcus. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 157-167; discussion, p. 167-168.

Various processes for copper film formation and a process which is being used commercially for metallizing all types of thermoplastic and thermosetting resins. However, need for further research is indicated. Apparatus for testing the adhesion of the composite metal coating to the plastic surface; some results. 10 ref.

8-136. A Circulating Electrolyte Cell for Strip Plating Evaluation. R. A. Dimon. *Proceedings, American Electroplaters' Society*, v. 35. 1949, p. 169-184; discussion, p. 184-185.

Previously abstracted from *Steel*, item 8-213, 1948.

8-137. The Electroplaters' Metals of the Future. Frederick A. Lowenheim. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 187-201; discussion, p. 201.

16 metals are now being electrodeposited commercially. Systematically reviews the literature and discusses the possibilities for plating the other 57. 40 ref.

8-138. Diaphragm Tanks to Eliminate Roughness in Copper Plating. R. H. McCahan, C. E. MacKinnon, and D. A. Swalheim. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 203-210; discussion, p. 211-213.

Apparatus developed by DuPont to meet new high standards for finish of Cu plating used as an intermediate metal on which Ni and Cr are deposited. Alternative schemes.

8-139. Metal Cleaning and a Simple Test for Surface Cleanliness. George B. Hogaboom. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 215-219; discussion, p. 219-221.

Simple test solution and its use to check cleanliness of steel surfaces before electroplating.

8-140. Industrial Electropolishing. Charles L. Faust and E. E. Graves. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 223-236; discussion, p. 236-239.

An illustrated review. Advances since previous article by the senior author (1946). 24 ref.

8-141. Electropolishing Silver in Cyanide Solutions. Daniel Gray. *Proceedings, American Electroplaters' Society*, v. 35, 1949, p. 241-246; discussion, p. 246-249.

Details of commercial procedure and now in use for large-scale silverware production.

8-142. Belgian Method of Copperplate

All through the summer—through hot, humid days and hot, humid nights—the biggest thief in America will be raiding your plant. Wherever steel is handled—where it is stamped and milled or machined or ground, where it is pickled or cleaned or assembled—RUST will be busy, robbing you of production, robbing you of profit.

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Protection for Mirrors Explained by Specialist in Process. Alexis Preat. *Glass Digest,* v. 28, May 1949, p. 18, 26.

Process now in commercial production in Belgium, in which the silver-mirror deposit is plated with copper.

8-143. The Estimation of Small Amounts of Zinc and Cadmium in Nickel Baths. K. Gardner. *Electroplating and Metal Finishing,* v. 2, May 1949, p. 303-306.

Shortened method for the polarographic determination.

8-144. Barrel Plating Without Tears. A. W. Wallbank. *Electroplating and Metal Finishing,* v. 2, May 1949, p. 355-358; discussion, p. 358-359.

8-145. A Consideration of the Mechanisms of Electrodeposition Reactions and Overvoltage. A. L. Ferguson. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 50-57; discussion, p. 127-141.

In general terms. Outline of work since 1920 in the Electrochemistry Laboratory of the University of Michigan. Conclusions reached as a result of experiments. The author finds it impossible to account for many experimental facts on the basis of modern theories. However, the theory that the hydrogen-electrode potential is always determined by the activity of hydrogen atoms and ions at the electrode-solution interface explains most of the results.

8-146. Hydrogen Overvoltage. A. Frumkin. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 57-67; discussion, p. 127-141.

In the case of hydrogen evolution on mercury from acid solutions, the slowest stage of the reaction is the discharge of hydrogen ion which completely determines the kinetics of the over-all reaction. In the case of cathodes with low overvoltage, the rate of the discharge stage can also be determined experimentally; however, the rate is also affected by subsequent stages. Over-voltage remains unchanged when the anodic process and dissolution of the metal occur simultaneously thus making possible conclusions regarding steady-state potential and rate of dissolution of metal. 43 ref.

8-147. Some Electron Transfer Processes in Heterogeneous Systems. Part I. Electrodeposition of Hydrogen. J. Weiss. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 68-71; discussion, p. 127-141.

Theoretical analysis of electrodes of low overvoltage, where the discharged atoms are strongly adsorbed and electrodes of high overvoltage, where the H atoms are only weakly adsorbed. 11 ref.

8-148. The Theory of Overvoltage. René Audubert. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 72-80; discussion, p. 127-141.

Recent experimental work which makes possible satisfactory theoretical interpretation of many observations. 14 ref.

8-149. The Interpretation of Overpotential Measurements. J. N. Agar. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 81-86; discussion, p. 127-141.

The influence of temperature and of concentration of reactants and neutral salts on overvoltage, and some of the possible implications of experimental results in this field. 23 ref.

8-150. Studies in Electrolytic Polarisation. II. The Effect of the Solvent on the Hydrogen Overpotential. J. O'M. Bockris. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 95-106; discussion, p. 127-141.

Hydrogen overvoltage on Pb, Cu, and Ni cathodes was measured in solutions of HCl in methyl and ethyl alcohols, ethylene glycol, formic and acetic acids, ether, and dioxane and in mixtures of these with water except in the cases of formic acid and ether. Long time-decay and the effect of stirring. Results do not agree with known versions of the neutralization or reaction-rate theories. Suggests a catalytic mechanism, in which adsorbed solvent molecules influence the rate of formation of H_2 molecules from H atoms. 27 ref.

8-151. Deposition of Metals. Introduction. A. W. Hothersall. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 141-144.

Introduces five papers on the subject.

8-152. Crystal Growth at the Cathode. G. I. Finch, H. Wilman, and L. Yang. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 144-158; discussion, p. 190-200.

Literature on the above as revealed by use of the microscope, by X-rays, or by electron diffraction. Diffraction patterns of electropolished Cu crystals, of Ag, Au, and Ni on Cu crystals, and of Ni and Zn deposits. 64 ref.

8-153. The Influence of Change of Size in Electrochemical Systems. J. N. Agar and T. P. Hoar. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 158-162; discussion, p. 190-200.

Consideration of two cells having the same electrolyte and electrodes, but differing in size, shows that they are not, in general, true models of one another, as regards magnitude and distribution of current and potential. In very large cells, the resistance of the electrolyte becomes the most important factor, while in very small cells electrode polarization is predominant. Two cells of different sizes may be true models of one another provided the specific conductivity of the electrolyte is made proportional to the linear dimensions.

8-154. Factors in Throwing Power Illustrated by Potential-Current Diagrams. T. P. Hoar and J. N. Agar. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 162-168.

Relationships between current, potential, and resistance for the Haring throwing-power cell. The influence of electrolytic resistance, cathodic polarization, cathodic current density, cathodic current efficiency, and size of cell. 15 ref.

8-155. Overvoltage in Metal Deposition and Dissolution. I. Nickel. F. W. Salt. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 169-181; discussion, p. 190-200.

The electronic interrupter devised by Hickling was used to study the decay of polarization which accompanies the electrolytic deposition and dissolution of nickel, and to determine the polarization free from resistance error. The influence of current density, pH, buffering agents, nickel-ion activity, and temperature. 18 ref.

8-156. Polarisation in the Electrodeposition of Metals. G. E. Gardam. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 182-190; discussion, p. 190-200.

Cathodic polarization of a metal-deposition process is caused by one or more of the processes necessary to bring the hydrated and possibly complex metal ion to the cathode, add an electron to it, and build the resulting atom into one of the grains comprising the cathode deposit. The extent to which each of these may affect polarization. 25 ref.

8-157. Oxygen Overvoltage. Part I. The Influence of Electrode Material, Current Density, and Time in Aqueous Solution. A. Hickling and S. Hill. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 236-246; discussion, p. 248-254.

A thorough survey was made of conditions necessary to obtain reproducible oxygen overvoltage measurements, and an experimental method was developed which gives reliable values. This method was applied to a study of the behavior of 12 different anode metals in alkaline solution over the current density range 10^{-5} to 1 amp. per sq. cm. 23 ref.

8-158. The Anodic Behaviour of Metals. Part IV. Silver. A. Hickling and D. Taylor. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 277-285; discussion, p. 298-302.

The initial build-up of anodic polarization at a silver anode over a wide range of conditions, using the cathode-ray oscillograph. In NaOH solution three main stages were distinguished: charging of a double layer, formation of an Ag_2O film, and formation of an oxide of silver higher than Ag_2O_2 which decomposes to give the latter substance. Below about pH 9 a silver anode does not become satisfactorily passive and the anodic process is merely the dissolution of silver. 13 ref.

8-159. The Standard Electrode Potentials of the Elements. J. O'M. Bockris and J. F. Herringshaw. "Electrode Processes" (*Discussions of the Faraday Society,* no. 1, 1947), p. 328-334.

Results of a comprehensive and critical examination and correlation of literature data. 120 ref.

8-160. Abscheidungsgeschwindigkeit und Struktur der Hartchromniederschläge in Chrombädern mit abnorm hohem Schwefelsäuregehalt. (Rate of Deposition and Structure of Hard-Chromium Deposits in Chromium Baths With Abnormally High Sulfuric Acid Contents.) R. Bilfinger. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 27-30.

Rate of Cr deposition is increased if the higher H_2SO_4 concentration is accompanied by higher current densities and higher bath temperatures. Three factors affect the density and porosity of the Cr deposit.

8-161. Zur Theorie der Chromabscheidung aus wässrigen Chromsäurelösungen. (The Theory on the Deposition of Chromium From Aqueous Chromic Acid Solutions.) Erich Muller. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 110-120.

An extensive theoretical discussion.

8-162. Das Dickenwachstum anodisch erzeugter Oxydschichten auf Aluminium und seine Grenzen. (The Increase in Thickness of Anodically Produced Oxide Films on Aluminum and Its Limits.) G. Elssner and A. Beyer. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 120-130.

In the anodization of articles with small holes (0.5-2.0 mm.), changes in dimensions and hardnesses do not follow the generally valid laws of the growth of films. Approximately uniform hardness can be obtained by controlling the time

and temperature of the treatment. 11 ref.

8-163. Untersuchung uber den Einfluss von hochfrequenten Wechselströmen bei der elektrolytischen Abscheidung von Chrom. (Research on the Effect of High-Frequency Alternating Currents on the Electrolytic Deposition of Chromium.) R. Bilfinger. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 131-135.

Experiments show no desirable effects for the above. The effects of superimposed high-frequency a.c. on current output in the electrodeposition of Ni from a commercial Ni-plating bath and of Cu from a cyanide-containing bath were also determined.

8-164. Eigenschaften und Bedeutung der Kobaltuberzuge. (Properties and Significance of Cobalt Coatings.) A. Kufferath. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 135-136.

Includes a discussion on the defects of cobalt electroplates, their causes, and methods of elimination; also the simultaneous deposition of Ni and Co. 11 ref.

8-165. Die Hartverchromung des Aluminiums und seiner Legierungen. (Hard-Chromium Plating of Aluminum and Its Alloys.) K. Gebauer. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 172-178.

Several methods. Properties and uses of the products.

8-166. Zusammenhänge zwischen Entstehungsbedingungen und Form elektrolytisch gewachsener Metallkristalle. I. Zur Entstehung von Blockstrukturen elektrolytisch gewachsener Metallkristalle. II. Die Rolle der Inhibitoren bei mässiger Inhibition. (Relationships Between Conditions of Formation and Shape of Electrodeposited Metal Crystals. I. The Formation of Block Structures in Electrodeposited Metal Crystals. II. The Role of Inhibitors Having a Moderate Effect.) Hellmut Fischer. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 161-170; July 1948, p. 204-210.

In Part I, a theory of crystal growth, showing effects of a variety of factors. Dimensions of growth layers are calculated for silver crystals. Results indicate that the surface is never wholly passivated, but always retains some residual activity. Part II presents effects of mild inhibitors.

8-167. Production Line Plating on Magnesium. *Steel,* v. 124, May 30, 1949, p. 56-58, 86.

Newly-developed process for plating Cu, Ni, Cr, Au, Ag, brass, and other metals on Mg articles. Consists of an initial application of an immersion Zn coating followed by Cu striking and electroplating in standard plating baths.

8-168. Cobalt-Nickel Deposition in Electrotyping. R. F. Ledford. *Plating,* v. 36, June 1949, p. 560-565.

Steps in manufacture of electrotypes. Requirements, Co-Ni deposits, effects of variables, stress measurements, effect of impurities, and their removal.

8-169. Plating of Bright Nickel and Decorative Chromium Without Reracking, Arthur W. Logozzo, *Plating,* v. 36, June 1949, p. 567-570, 660.

Problems of racking, rack coatings, and control of metallic impurities in bright-Ni baths.

8-170. Use of the Cathode Ray Oscillograph in the Measurement of Metal Areas and the Kinetics of Electrode Reactions. A. T. Hutcheon and C. A. Winkler. *Canadian Journal of Research,* v. 27, sec. B, Apr. 1949, p. 353-360.

The instrument was developed to obtain information on the change in surface area during cadmium deposition, in order to find "true current density"—polarization relations. 10 ref.

8-171. Recent Developments in Plating on Plastics. Allen G. Gray. *Products Finishing,* v. 13, June 1949, p. 94, 96, 98, 100; 102, 104, 106.

Method which employs reduced copper films.

8-172. Plating Magnetic Cobalt-Nickel Alloys on Wire. *Iron Age,* v. 163, June 9, 1949, p. 49.

Process used by Brush Development Co. for electroplating silicon-bronze wire with 80% Ni-Co alloy.

8-173. Production Clinic for Finishing Die Castings. *Die Castings,* v. 7, June 1949, p. 39-42.

Reviews recent papers on: treatment of plating wastes; plating on lead and its alloys; and lacquers for rapid drying.

8-174. Un procédé d'étude et de régulation du polissage électrolytique des métaux. (A Method for Study and Regulation of the Electropolishing of Metals.) I. Epelboin, C. Chalin, and B. Galperin. *Revue de Métallurgie,* v. 46, Mar. 1949, p. 151-154.

Electronic apparatus for recording the current-voltage curve during electropolishing. Possibility of application to process control. 14 ref.

8-175. Die anodische Oxydation des Aluminiums in verschiedenen zusammengesetzten Oxalsäurelösungen. (The Anodic Oxidation of Aluminum in Oxalic Acid Solutions of Different Compositions.) A. von Zeerleder and W. Hubner. *Chimia,* v. 3, Apr. 15, 1949, p. 77-84.

Effects of a series of above solutions over a range of pH values, temperatures, and voltages.

8-176. Die Hartverchromung von Kaltziehwerkzeugen kleiner Durchmesser. (Hard-Chromium Plating of Small-Diameter Cold-Drawing Tools.) Walter Eilender, Heinrich Arend, and Paul Form. *Metalloberfläche,* v. 3, Mar. 1949, p. 59-61.

Optimum hardness and thickness of plating with respect to wear resistance.

8-177. Ein Elektrolyt zum Atzpolieren von Stählen. (An Electrolyte for the Electropolishing of Steels.) Walter Eilender, Heinrich Arend, Ulrich Eggers, and Franz Sadrazil. *Metalloberfläche,* v. 3, sec. A, Apr. 1949, p. 88-90.

The explosive perchloric acid electrolyte was replaced by an electrolyte composed of H_2SO_4, H_3PO_4, and a little water. Satisfactory results are believed to justify commercial use.

8-178. (Book) **Canning Handbook on Electroplating.** Ed. 16. 553 pages. W. Canning & Co., Ltd., Great Hampton Street, Birmingham 18, England. 21s.

A practical guide and reference book for the supervisor, production manager, foreman plater, and others concerned with finishing operations. Separate sections are devoted to polishing; cleaning, pickling, and dipping; electroplating; and bronzing, lacquering, and enameling.

8-179. (Book) **Electrode Processes.** *(Discussions of the Faraday Society,* No. 1, 1947.) 338 pages. Gurney and Jackson, 98 Great Russell St., London, England.

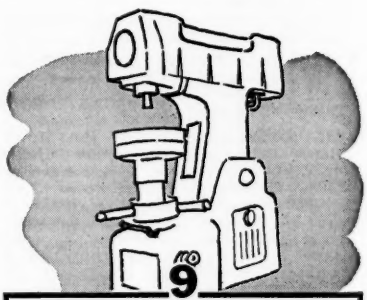
Papers and accompanying discussion presented at Manchester, England, Apr. 9-10, 1947. They are classified under the headings: general and theoretical; deposition of hydrogen; deposition of metals; and anodic and other electrodic processes. Individual papers of direct metallurgical interest are being abstracted separately.

8-180. (Book) **Répertoire Technique des Applications Industrielles du Chrome Dur.** (Hard Chromium Plating.) Paul Morisset. 220 pages. 1948. 209, bd. Saint-Germain, Paris 7, France. 600 Francs.

Properties of Cr. Process and the problems involved. 1119 ref.

For additional annotations indexed in other sections, see:

3C-121; 7D-32



9 PHYSICAL and MECHANICAL TESTING

9-147. The Accurate Measurement of Photo-Elastic Stress Patterns. *Engineer,* v. 187, Apr. 29, 1949, p. 468.

Principles of plane and three-dimensional stress analysis and photoelastic method and apparatus.

9-148. Testing and Inspection. J. T. Stacy. *Metals Review,* v. 22, May 1949, p. 5-8.

Improvements in common mechanical test methods and equipment, some new ways of predicting behavior of metals, and unusual kinks in inspection, as revealed by technical literature of the past year. Reference to "A.S.M. Review of Current Metal Literature."

9-149. A Visual Method for Demonstrating the Path of Ultrasonic Waves Through Thin Plates of Material. Charles J. Burton and R. Bowling Barnes. *Journal of Applied Physics,* v. 20, May 1949, p.462-467.

Method and the complexity of ultrasonic reflection and transmission by metal plates. An attempt to estimate critical angles of total reflection for dilatation and shear waves by visual examination of reflection of an ultrasonic beam. Using these data, Young's modulus and the shear modulus for a 1/16-in. aluminum sheet were determined and the values compared with those obtained using a previously described electrical method and with published data. 10 ref.

9-150. Experiments on the Plastic Failure of Cylindrical Shells. A. J. S. Pippard and Letitia Chitty. *Sheet Metal Industries,* v. 26, May 1949, p. 981-983. A condensation.

Object of investigation was to study the behavior of cylindrical shells when loaded beyond the elastic range by forces acting on a small area of the surface, and under certain specified conditions of support. Experiments included static tests in a test frame, dynamic tests by means of dropping weights, and a few tests under hydrostatic pressure.

9-151. Hardness Test Measures Tensile Strength of Manganese Bronze. Robert J. Feltrin. *Foundry,* v. 77, June 1949, p. 74-75, 230.

Use of test where marine propellers up to 20 ft. in diam. are cast to meet a tensile-strength range of 70,000-80,000 psi. Composition is: Cu, 56-58%; Zn, 37.0-41.0%; Mn, 0.5-1.0%;

Al, 1.1-1.3%; Fe, 0.9-1.1%; Sn, 0.4-0.6%; and Ni, 1.0%.

9-152. Behavior of Metals Under Direct or Nonreversed Loading. John R. Low, Jr. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949 p. 17-59.

Standard tension test at room temperature and low strain rates. Typical true stress-strain curves together with recent observations on the general equation for form of curves. Compression test and its limitations. Data for ferrous metals and alloys. 19 ref.

9-153. Determination of the State of Stress. W. M. Murray. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 79-99.

Methods and apparatus available. 15 ref.

9-154. Testing to Specific Deflections (Buckling). E. C. Hartmann. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 124-139.

Testing for design and quality control. Column and beam tests for buckling.

9-155. Micro-Hardness Testing—A New Testing Method With Many Practical Applications. E. B. Bergsman. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 91-96.

The method, different types of apparatus, and examples of application.

9-156. Uber die Messung von grossen Kräften. (Concerning the Measurement of Large Forces.) P. Nycander. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 99-104.

A temperature-insensitive hydraulic method of determining absolute values of compressive forces up to 500 metric tons used for the purpose of calibrating testing machines.

9-157. Electric Resistance Wire Strain Gage Technique in Aircraft Structural Work. L. A. Strömberg. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 118-122.

Procedures and equipment used in Sweden.

9-158. Prufung metallischer Werkstoffe in der Kälte. (Low-Temperature Testing of Metals.) Karl Wellinger and Artur Hofmann. *Zeitschrift fur Metallkunde,* v. 39, Aug. 1948, p. 233-239.

Low-temperature tensile and fatigue-strength testing machines. Low-temperature strengths of pure Al, of a 3%-Mg Al alloy, and of a 2%-Mn, 2%-Mg Al alloy. 24 ref.

9-159. Automatic Torque Magnetometer Measures Magnetic Anisotropy of Steel. *Steel Processing,* v. 35, May 1949, p. 245-247.

9-160. Quality in Drawing Steel. C. A. Burkhalter. *Steel Processing,* v. 35, May 1949, p. 250-251, 262. A condensation.

Problem of evaluation of drawability which is complicated by the large number of test methods in use. Attempts to classify commonly used tests on the basis of practicability. Procedures.

9-161. Two New Instruments for Materials Testing. K. Ruhl. *Engineers' Digest,* v. 10, May 1949, p. 168. Translated and condensed from *Die Technik,* v. 3, July 1948, p. 301-304.

Inductive accelerometer and clock-gage-type extensometer for measuring strains.

9-162. Resistance of Materials. *Machine Design,* v. 21, June 1949, p. 105-106.

Equipment used by Allis-Chalmers to determine resistance to the destructive action of cavitation. High-frequency oscillator vibrates specimen at 6500 cycles per sec. with amplitude of 0.00342 in.

9-163. A 30-Ton Universal Testing Machine. *Engineer,* v. 187, May 13, 1949, p. 533-535.

British equipment.

9-164. Chart Eases Selection of Resistance Gage. *Aviation Week,* v. 50, June 6, 1949, p. 33-34.

Chart to facilitate selection of bonded electric strain gages for specific installations.

9-165. Report of Committee A-6 on Magnetic Properties. *American Society for Testing Materials,* Preprint 4, 1949, 32 pages.

Includes proposed revised standard methods for testing magnetic materials; for determining normal induction and hysteresis (13 ref.); and for core loss and permeability by a.c. procedures.

9-166. A New High-Speed Sheet Metal Fatigue Testing Machine for Unsymmetrical Bending Studies. G. R. Gohn and E. R. Morton. *American Society for Testing Materials,* Preprint 31, 1949, 12 pages.

Constant-deflection machine suitable for testing 24 sheet-metal specimens simultaneously at as many as 12 different values of mean stress and at any testing speed up to 3000 r.p.m. Alternating stresses ranging from zero to a maximum value corresponding to a deflection of 1 in. may be superimposed upon any mean stress of such magnitude that the total deflection does not exceed 2 in. The machine is capable of testing sheet or strip of 0.010-0.050 in. thickness.

9-167. Effect of Speed of Testing on the Tensile Properties of Austenitic Stainless Steel Sheets. R. H. Heyer. *ASTM Bulletin,* May 1949, p. 57-62.

Presents and correlates results of a cooperative test program.

9-168. Influence of Type of Machine, Range of Speed, and Specimen Shape on Fatigue Test Data. P. K. Roos, D. C. Lemmon, and J. T. Ransom. *ASTM Bulletin,* May 1949, p. 63-65.

Tests were made on flat and round specimens of SAE 4340 steel in pure reversed plane bending at 1800 r.p.m. on a Sonntag universal machine; and on round specimens acting as rotating beams on R.R. Moore machines at 1800 and 10,000 r.p.m.

9-169. New Optical Method for Study of Stresses by Polarized Light. In Russian.) A. V. Stepanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Feb. 1949, p. 205-217.

New optical method and apparatus and its application to study of stresses in silver chloride crystals which, being transparent and possessing structure and mechanical properties similar to those of metals, permits derivation of conclusions and laws applicable to the latter.

9-170. Contemporary Development of an Optical Polarization Method for Determination of Stresses. (In Russian.) N. I. Prigorovskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 305-321.

Use of transparent models, both two and three dimensional, for the determination of the distribution and value of stresses. Theoretical bases of this method and formulas for calculation. 19 ref.

9-171. Portable Creep-Test Machine. (In Russian.) M. P. Markovets and N. I. Mikheev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 376-378.

Apparatus suitable for temperatures up to 900° C. with a maximum load of 800 kg. Electric circuit for automatic control of temperature within ±2° C.

9-172. Apparatus for Testing of Springs in Compression and Tension on the Rockwell Apparatus. (In Russian.) N. M. Stepanov-Grebennikov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 378-379.

Apparatus and method of its calibration and operation. It is designed for loads of 10-150 kg. and for springs, tested in compression, of 150-mm. length, and in tension, of 100-mm. length.

9-173. Festigkeitsprufverfahren fur Stahldraht. (Strength Testing Methods for Steel Wire.) N. Ludwig. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 49-66.

Evaluates the various methods. 48 ref.

9-174. Resisténcia a tracao e composicao quimica no ferro fundido cinzento. (Tensile Strength and Chemical Composition of Cast Iron.) Egon Schmiegelow and Joao Mendes Franca. *Boletim da Associacao Brasileira de Metais,* v. 5, Jan. 1949, p. 27-40.

Critically analyzes Heller and Jungbluth's formula for calculation of tensile strength of cast iron from tests on two specimens of different diameters. Proposes a new graphic method for such determination, including the influence of chemical composition. Diagram permits a rapid determination of tensile strength on the basis of data obtained from testing a standard specimen.

9-175. A Carrier-Type Strain Indicator. George W. Cook. *David W. Taylor Model Basin, U. S. Navy,* Report 565, Nov. 1946, 28 pages.

An electronic instrument which is suitable for measuring and recording static and dynamic strains by means of strain gages of the wire-resistance type and suitable recording apparatus.

9-176. (Book) **Indentation Hardness Testing.** Vincent E. Lysaght. 290 pages. Reinhold Publishing Corp., 330 W. 42nd St., New York 18. N. Y. $5.50.

Hardness testers in common use in the U. S. and the problems associated with their use. Sufficient historical background is presented to acquaint the reader with the development of various instruments. Likewise, sufficient theory is given for a thorough knowledge of the present status of hardness testing.

For additional annotations indexed in other sections, see:

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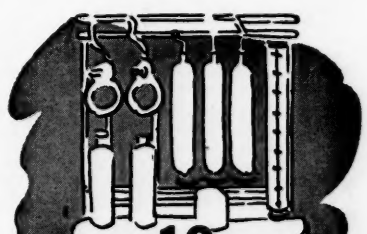

10A—General

10A-70. Use of Ion Exchangers in Analytical Chemistry. R. H. Lafferty, Jr. *U. S. Atomic Energy Commission,* AECD-2414, Nov. 19, 1948, 11 pages.

A review. 56 ref.

10A-71. Recent Developments in the Technique of Infra-Red Spectroscopy With Some Applications to Scientific and Industrial Problems. G. B. B. M. Sutherland. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 5-16.

52 references.

10A-72. Photoelectric Intensity Measurements in Spectra. C. H. Dieke. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 17-37.

Advantages and disadvantages as compared with photographic methods, giving details of construction and operation of equipment for photo-electric work. 27 ref.

10A-73. On the Use of Spectrochemical Analysis in the Boliden Mining Company. A. Danielsson. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 51-55.

Use by Swedish company.

10A-74. Ultramicroanalysis by X-Ray Absorption Spectrography. A. Engström. *Transactions, Instruments and Measurements Conference* (Stockholm,) 1947, p. 71-75.

Apparatus, technique, and applications. 12 ref.

10A-75. Adaptation of Secondary X-Ray Analysis for Industrial Purposes. A. Kochanovska. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 76-78.

Method and applications.

10A-76. Chemical Analysis by Secondary X-Ray Images. L. von Hamos. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 79-80.

Method of secondary X-ray analysis, where curved crystals have been successfully employed.

10A-77. Uber die Röntgenabsorptionsanalyse und ihre Anwendungsmöglichkeiten in der Technik. (Concerning X-Ray Absorption Analysis and Its Technical Application Possibilities.) E. Laurila. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 81-85.

Fundamental principles, apparatus, and present and potential applications.

10A-78. Recent Applications of Controlled Potential Electrolysis. James J. Lingane. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 203-212; discussion, p. 223-225.

A relatively simple potentiostat for automatically maintaining the potential of a working electrode constant during electrolysis. Several recent applications, including separation of metals prior to polarographic analysis, electrolytic preparation of organic compounds, coulometric analysis, and determination of oxidation states that correspond to polarographic waves observed in complicated reactions at the dropping-mercury electrode. 16 ref.

10A-79. Spektrographische Analysenmethoden im Bereich des Erzbergbaues und Metallhuttenwesens. (Spectrographic Methods of Analysis Used in Mining and Metallurgy.) Leutwein. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 75-82.

A general but detailed study of methods of analysis of minerals, mine samples, dressed ores, concentrates, pig metals, and scrap. Apparatus and techniques. 12 ref.

10A-80. Uber die Verwendung des Wechselstrom-Kohlebogens zur quantitativen Spektralanalyse. (Application of the Alternating-Current Carbon Arc for Quantitative Spectral Analysis.) F. Rost. *Zeitschrift fur Angewandte Physik,* v. 1, July 1948, p. 136-139.

Simple processes for determining Al, Ca, Fe, Mg, and Ti in quartz sand; Al, Ca, Fe, Mg, Si, and Ti in coal-tar pitch; and Mo in elementary boron. The a.c. arc differs from the d.c. arc in its small size (3 mm. maximum) and reduced sensitivity to traces. 21 ref.

10A-81. Factors Affecting Accuracy in Spectrographic Analysis. (In English.) Maurice Milbourn. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 267-277.

Factors and possibilities of improving accuracy, 19 ref.

10A-82. Die systematischen Fehler bei der photographischphotometrischen Auswertung von Spektralaufnahmen. (Systematic Errors in the Photographic-Photometric Evaluation of Spectral Patterns.) H. Kaiser. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 278-296.

A generalized scheme for the evaluation of spectra, and application of the theory of density transformations, which lead to a general equation for systematic errors in the evaluation of density measurements in spectrophotometry.

10A-83. Der Einfluss des Untergrunds auf die Gestalt spektrochemischer Eichkurven. (The Influence of Background on the Form of Spectrochemical Calibration Curves.) H. Kaiser. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 297-319.

Theory and equations for the above. For systematic errors of analysis which arise through use of a substituted straight line, a simple formula is given. From this a graph is derived for determining whether or not a background correction is necessary in a given case. Theory is illustrated by an experimental example (determination of Mn in Al).

10A-84. Quantitative Spectrographic Analysis by Spark Excitation of Metallic Oxides. (In English.) Maurice Milbourn and H. E. R. Hartley. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 320-326.

New technique for analyzing a finely ground powder, such as a mixture of metallic oxides, which is placed in a crater in the lower electrode of a spark discharge. The powder is ejected continuously into the vapor column, and a source combining good sensitivity and reproducibility is obtained. This technique has been used successfully for many metallurgical analyses, especially those which are not of a routine nature.

10A-85. Some Improvements in the Technique of Spectrographic Analysis of High Purity Materials. (In English.) D. M. Smith and G. M. Wiggins. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 327-340.

Various aspects, using the intermittent a.c. arc and the constant current d.c. arc as excitation sources. High-purity graphite electrodes are generally used for analysis of metals and compounds, although the carbon arc in steam is used for analysis of rare-earth oxides for other rare-earth elements present as impurities. A method for the complete qualitative analysis of volatile elements and compounds.

10A-86. Une méthode d'analvse spectrale applicable a de faibles traces d'impuretés dans les métaux. (A Method of Spectrographic Analysis Applicable to Minute Traces of Impurities in Metals.) J. Orsag. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 341-345.

For estimating volatile impurities it has been found practicable to make use of three alloys near the lower limit of chemical analysis for a complete calibration line. Results of application to Na in Al. As little as 0.0005% Na was estimated.

10A-87. Estimation of Coal Dust in Foundry Sand. A. McD. McConnell and J. McPheat. *Foundry Trade Journal,* v. 86, May 19, 1949, p. 465-469.

Previously described methods and new combustion-train method, said to be superior. Typical results.

10A-88. Principles and Limits of Accuracy in Polarographic Analysis. Paul H. Sherrick. *Canadian Chemistry and Process Industries,* v. 33, May 1949, p. 415-420, 423-424.

10A-89. Determination of Nonmetallic Inclusions in Samples of Metal Obtained at Different Stages of Melting. (In Russian.) A. M. Danilov and E. D. Mokhir. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 358-362.

Technique of sampling and determination. Typical results.

10A-90. Rapid Determination of Calcium in Sinter Cakes. (In Russian.) Yu. I. Usatenko and P. A. Bulakhova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 362-363.

Procedure and reagents used. Time of determination is ½ hour, said to be several times less than for commonly used methods.

10A-91. Phosphattitration weiterer Schwermetall-Ionen. (Phosphate Titration of Additional Heavy-Metal Ions.) Hugo Krause. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 129, no. 1, 1949, p. 43-61.

Details of methods applicable to Fe, Ni, Cu, Sn, Bi, Hg, and Ti ions.

10A-92. (Book) **Recent Advances in Analytical Chemistry.** R. E. Burk and Oliver Grummitt, editors. 209 pages. 1949. Interscience Publishers, 215 Fourth Ave., New York, N. Y. (Frontiers in Chemistry, v. 7.)

"Voltammetry (Polarography) and Amperometric Titrations", I. M. Kolthoff; "Inorganic Analysis With Organic Reagents", John H. Yoe; "Some Recent Colorimetric and Gravimetric Organic Reagents", John H. Yoe; "Application of Infrared Spectroscopy in Analysis", Otto Beeck; "Electron Microscopy and Microanalysis — New Methods in Chemistry", James Hillier; "Fractionation, Analysis, and Purification of Hydrocarbons", Frederick D. Rossini; and "Applications of the Mass Spectrometer", J. A. Hipple. 150 ref.

10B—Ferrous

10B-42. Spark Spectrum of Iron From 4650 to 2242 A. Ed. 2. A Gatterer and J. Junkes. *Specola Vaticana,* (Vatican City, Italy.) 1947, 24 pages.

Method of exposure, determination of wave lengths, and purpose of tables. Includes 13 spectrographic plates.

10B-43. The Method Used in the Murex Laboratories for the Determination of Tungsten in Ferrotungsten. E. A. Chidley. *Murex Review,* v. 1, No. 3, 1949, p. 58-59.

Details of gravimetric procedure.

10B-44. The Determination of Phosphorus in Haematite Iron and Steel by the Molybdenum Blue Method. T. S. Harrison. *Journal of the Society of Chemical Industry,* v. 68, Mar. 1949, p. 84-88.

Previous work and detailed theoretical and experimental analysis of Vaughan's method, showing how it can be incorporated in a composite system of analysis. 33 ref.

10B-45. Colorimetric Determination of Silicon in Low-Alloy and Carbon Steels. Uno T. Hill. *Analytical Chemistry,* v. 21, May 1949, p. 589-591.

Method based on the yellow silicomolybdate color is improved in accuracy and increased in range by utilization of a decolorized blank containing all the reagents used to produce the color. Suitable for routine analytical work. 19 ref.

10B-46. Vanadium as Phosphotungstovanadate; A Spectrophotometric Method. M. D. Cooper and Paul K. Winter. *Analytical Chemistry,* v. 21, May 1949, p. 605-609.

Four variations of procedure for determination of V in low-alloy steels.

10B-47. Colorimetric Determination of Aluminum in Steel; Use of 8-Hydroxyquinoline. Stephen E. Wiberley and Lewis G. Bassett. *Analytical Chemistry,* v. 21, May 1949, p. 609-612.

Simple, rapid, and accurate method for small quantities. Application to various types of samples. Effects of interfering elements and of variables such as wave length, pH, and amount of reagent.

10B-48. Spectrophotometric Determination of Iron in Ores With Kojic Acid. J. P. Mehlig and M. J. Shepherd, Jr. *Analytical Chemistry,* v. 21, May 1949, p. 642-643.

Procedure and typical results. 10 ref.

10B-49. Volumetric Determination of Iron; Liquid Zinc Amalgam and Chromous Chloride as Reductors. William D. Cooke, Fred Hazel, and Wallace M. McNabb. *Analytical Chemistry,* v. 21, May 1949, p. 643-644.

Procedure and typical results.

10B-50. Le dosage spectrographique de l'alumine dans les résidus d'oxydes métalliques. Application au dosage de l'oxygéne dans les aciers spéciaux. (Spectrographic Analysis of Aluminum in Metallic-Oxide Residues. Application to Determination of Oxygen in Special Steels.) R. Castro and J. M. Phéline. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 379-388.

To estimate alumina in steel, the calcined residue from a HCl solution of the metal is dissolved in potassium bisulfate by fusion, and an aqueous solution containing cobalt sulfate is made. This solution is sparked on copper electrodes, using a spark source without a synchronous interrupter, and the Al lines are compared with those of Co. The oxygen content of the steel can sometimes be deduced from the alumina figure obtained in this way. 14 ref.

10B-51. The Determination of Copper in Nickel-Bearing Steels and Cast Irons: a Photometric Method. S. D. Steele and L. Russell. *Analyst,* v. 74, Feb. 1949, p. 105-112.

10B-52. Analysis of Nonmetallic Inclusions in Alloy Steel. (In Russian.) M. M. Shapiro and R. E. Grabarovskaya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 259-264.

Method of separating stable nonmetallic inclusions according to their type. The type of inclusion is determined by its solubility in HCl or a mixture of HF and H_2SO_4. The technique of this method. Data from typical analyses.

10B-53. Determination of Carbides in Chromium-Nickel Steels Containing Molybdenum and Tungsten. (In Russian.) N. M. Popova and A. F. Platonova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 267-269.

New technique. Data from a typical determination.

10B-54. Methods of Determination of Carbides and Slag Inclusions in Steels. (In Russian.) Ya. T. Lukashevich-Duvanova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 269-274.

Comparatively analyzes existing methods, indicating the best methods for individual cases. Data from investigation of five different steels (C, V, Mo, Ti, and Cr).

10B-55. Method for Determination of Nonmetallic Inclusions in the Austenitic Steel EYalT. (In Russian.) E. E. Cheburkova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 275-277.

Proposes application of an electrolytic method, using a 6% solution of $FeSO_4$ containing citrate and 7% NaCl at a current density of 0.5 amp. per sq. cm. Preliminary treatment, as well as the method itself.

10B-56. Photoelectric Method for Determination of Nitrogen in Steel. (In Russian.) V. F. Mal'tsev, F. M. Gertsman, and T. P. Temirenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 288-294.

Method developed for bonded nitrogen. 11 ref.

10C—Nonferrous

10C-85. Tungsten in Low-Grade Ores; Quantitative Spectrographic Determination. David Kaufman and S. K. Derderian. *Analytical Chemistry,* v. 21, May 1949, p. 613-616.

Method applicable to 0.001-0.13% tungstic oxide; as much as 50% Fe_2O_3 can be tolerated.

10C-86. Bestimmungsmethode fur Lithium in Mineralien. (Method of Determining the Lithium in Minerals.) Carl Boy. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, July 1948, p. 112-113.

Chemical methods applicable to different minerals.

10C-87. Gegenwärtiger Stand der polarographischen Analyse von Zink und Zinklegierungen. (Present Status of the Polarographic Analysis of Zinc and Zinc Alloys.) E. Koppitz and H. Moritz. *Metall,* July 1948, p. 223-228.

Surveys the most important known methods. Defects of these methods and possibilities of their improvement. 18 ref.

10C-88. Die Bestimmung von Zink in Kupfer, sowie von Nickel und Blei in Kupfer und in verschiedenen Kupferlegierungen. (Determination of Zinc, Nickel, and Lead in Copper and Different Copper Alloys.) Felix Jablonski. *Metall,* Aug. 1948, p. 258-262.

Polarographic method. 11 ref.

10C-89. Contribution a l'Analyse des Traces dans les Non Ferreux. Applications de la Méthode Spectrographique apres Concentration Chimique. (The Determination of Traces in Nonferrous Metals. Application of a Spectrographic Method After Chemical Concentration.) G. Sempels. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 346-353.

Combined chemical and spectrographic assay methods are outlined for Bi and Th in Pb and its ores (or those of Cd) and for Co and Ni in Zn.

10C-90. Dosage spectrographique du Niobium et du Tantale. (Spectrographic Determination of Columbium and of Tantalum.) P. Herman. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 389-396.

The method described makes it possible to determine 1-99% Cb or Ta in samples containing small amounts of Ti and W. The pentoxides separated by a simple chemical process are spectrographed on graphite electrodes in the d.c. arc at 10 amp. Less than 0.02 g. of pentoxides is sufficient.

10C-91. The Spectra of the Heavy Elements. Frank S. Tomkins. *Journal of the Optical Society of America,* v. 39, May 1949, p. 357-363.

Most prominent spectrum lines of the elements from protoactinium to americium.

10C-92. Analysis of Rare Earth Oxides by Means of Emission Spectra. Part I. Persistent Lines in Arc Spectra of Rare Earth Elements. D. M. Smith and G. M. Wiggins. **Part II. A Technique for the Suppression of Cyanogen Bands in Carbon Arc Spectra of Rare Earth Oxides.** G. M. Wiggins. *Analyst,* v. 74, Feb. 1949, p. 95-104; discussion, p. 104.

10C-93. The Estimation of Selenium in Lead Alloys. F. W. Box. *Analyst,* v. 74, Feb. 1949, p. 120.

Volumetric procedure. Typical results.

10C-94. Ammonium Thioglycolate as a Colorimetric Analytical Reagent for Uranium (VI) in the Presence of Various Anions. W. H. Davenport, Jr., and P. F. Thomason. *U. S. Atomic Energy Commission,* AECD-2398, Aug. 1, 1948, 7 pages.

Hexavalent uranium forms a yellow-orange soluble complex with the above in a basic solution. The complex is fairly stable and unaffected by many common anions. The method is best suited to the determination of U in the range 0.100-1.600 mg. in 25 ml.

10C-95. A Source of Error in the Colorimetric Estimation of Uranium. T. R. Scott. *Nature,* v. 163, May 14, 1949, p. 768-769.

Traced to the presence of $NaHCO_3$ formed in varying amounts when the acid solutions from ether extractions are treated with an excess of Na_2CO_3, prior to the addition of H_2O_2.

10C-96. A Method for the Spectrochemical Determination of Thallium in Ores, Concentrates, Dusts, and Chemicals. Graham W. Marks and E. V. Potter, *U. S. Bureau of Mines,* Report of Investigations 4461, May 1949, 13 pages.

Occurrence of Tl and choice of spectral lines for analyses. Experimental procedure. 14 ref.

10C-97. Dosage de faibles quantites de cadmium dans les minerals. (Determination of Small Amounts of Cadmium in Minerals.) Marcel Orliac. *Comptes Rendus,* v. 228, Mar. 14, 1949, p. 930-931.

A new method for the above in the presence of Zn. Sodium diethyldithiocarbamate in an ammoniacal medium is used. Separation of Cu, Pb, Bi, Sb, Sn, Al, and Fe. The final colorimetric determination was performed using a photo-electric cell. Method permits determination of 10 g. of Cd per ton of mineral with a possible error of 10%.

10C-98. Dosimétrie par absorption différentielle des rayons X, a l'aide de spectrometres a cristaux courbés et compteurs de Geiger. (Analysis by Differential Absorption of X-Rays, With the Aid of Curved-Crystal Spectrometers and Geiger Counters.) Yvette Cauchois and Kenneth Mac Taggart. *Comptes Rendus,* v. 228, Mar. 28, 1949, p. 1003-1005.

New technique is particularly applicable to determination of zirconium in hafnium, or vice versa. Formulas for calculation.

10C-99. Spectrographic Analysis of Thin Nickel Wires and Foils. (In Russian.) A. N. Prokop'eva and K. I. Taganov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 299-301.

Method for wires of up to 0.1-mm. diam. and foils of up to 0.01-mm. thickness of silicon, copper, and manganese. The spectrograph and

the method of arc excitation. Typical results.

10C-100. Visual Method of Spectrographic Analysis According to Relative Intensity in Two Samples of Lines of the Elements Being Determined. (In Russian.) P. D. Korzh. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 301-304.

Method, including the spectrographic set-up giving the most accurate results. Typical results for Cr and Cu.

10C-101. Beitrag zur Bestimmung kleinster Cadmium-, Wismut-, Eisen-, Blei-, und Zinn-Gehalte nach photometrischen Messmethoden. (Determining Traces of Cadmium, Bismuth, Iron, Lead, and Tin by Photometric Methods.) Georg Geuer. *Angewandte Chemie*, v. 61, Mar. 1949, p. 99-103.

Rapid method for impurities in refined Zn and Al. 14 ref.

10C-102. Uber eine einfache Farbreaktion auf Galmei-Zink. (A Simple Color Reaction on Calamine Zinc Salts.) Alfred Neuhaus. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 2, Feb. 1949, p. 55-58.

Simple method for detecting zinc in minerals and of roughly estimating its relative amount in the hydrate of zinc silicate.

10D—Light Metals

10D-22. Determination of Copper by Dithio-Oxamide in Magnesium and Magnesium Alloys. H. H. Willard, Robert E. Mosher, and A. J. Boyle. *Analytical Chemistry*, v. 21, May 1949, p. 598-599.

Rapid, accurate, and direct colorimetric procedure. The color reagent employed is rubeanic acid (dithiooxamide) in combination with a buffer complex composed of acetate and malonic acid.

10D-23. Magnesium; Rapid Alkalimetric Determination in Calcium and Magnesium Carbonate Ores. S. C. Sane and M. S. Telang. *Analytical Chemistry*, v. 21, May 1949, p. 618-620.

10D-24. Colorimetrische Bestimmung von Magnesium mittels Titangelb unter Entfernung störender Elemente wie Eisen, Aluminium und Mangan durch Ausschuttelung mit Acetylaceton. (Colorimetric Determination of Magnesium With Titanium Yellow by Removing Disturbing Elements Such as Iron, Aluminum, and Manganese Through Extraction With Acetylacetone.) E. Abrahamczik. *Angewandte Chemie*, v. 61, Mar. 1949, p. 96-98.

A review. 55 ref.

10D-25. Uber einen Nachweis von Magnesium mit Azofarbstoffen. (Detection of Magnesium by Means of Azo Dyes.) Hermann Rath and Alberto Sanchez. *Fresenius' Zeitschrift fur Analytische Chemie*, v. 129, no. 1, 1949, p. 1-3.

For additional annotations indexed in other sections, see:

4B-49; 11-197

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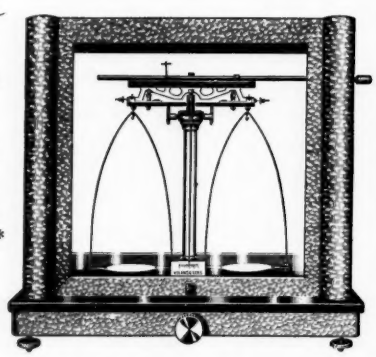

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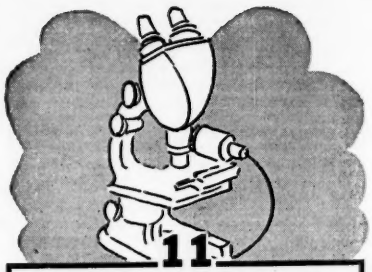

11 APPARATUS, INSTRUMENTS and METHODS

11-169. An Improved Method for Testing the Duration of Life of the Materials Employed as Electric Heating Resistors, Suggested for Use as a Standard International Method. Z. V. Ryska. *Nederlands Instituut voor Electrowarmte en Electrochemie*, "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 263-276; discussion, p. 347-366.

The U. S. ASTM standard and the standard British and German methods compared. According to the method proposed, temperature is maintained by an automatic electronic method based upon selective sensitivity for infrared radiation.

11-170. Further Applications of Multiple-Beam Interferometry. S. Tolansky. *Science Progress*, v. 37, Jan. 1949, p. 1-11.

Studies of metal surfaces.

11-171. Cross-Section Drawing of 3-Inch Experimental Cupola. *Pig Iron Rough Notes*, Winter-Spring 1949, p. 16-17.

A dimensional cross-section drawing of the McWane Midget Cupola which was described in Autumn 1948 issue.

11-172. The Experimental Determination of the Soundness of Crystals From X-Ray and Density Measurements. (In English.) M. E. Straumanis. *Acta Crystallographica*, v. 2, Apr. 1949, p. 82-84.

Method which makes possible the detection of imperfections in crystals of elements, compounds, and solid solutions by determination of molecular weights from X-ray and density measurements. Precision determinations of density and lattice constants are necessary for the calculations. Some metallic elements and some compounds. 13 ref.

11-173. Limits of Accuracy in the Determination of Lattice Parameters and Stresses by the Debye-Scherrer Method. (In English.) Hans Ekstein and Stanley Siegel. *Acta Crystallographica*, v. 2, Apr. 1949, p. 99-104.

The chief factor limiting above accuracy is the spectral width of the primary characteristic radiation. For a diffraction line with a smooth intensity distribution, recorded on film, error of measurement caused by irregular fluctuations of density arising from the film grain is determined experimentally. Present accuracy of stress measurements by X-rays has, in favorable cases, reached the limit given by the spectral width of the characteristic radiation.

11-174. Die Absorption der Röntgenstrahlen in Kristallen im Interferenzfall. (Absorption of X-Rays by Crystals in the Case of Interference.) M. von Laue. *Acta Crystallographica*, v. 2, Apr. 1949, p. 106-113.

Experiments by Borrmann show

that absorption of the primary X-ray in a perfect crystal is affected, and sometimes reduced, by the presence of diffracted rays. The case where both the primary and the diffracted rays leave the crystal slab by the same face; the change of absorption of the primary ray is calculated according to the dynamical theory of X-ray diffraction and is found to be in general agreement with Borrmann's observations. 11 ref.

11-175. A Punched-Card Modification of the Beevers-Lipson Method of Fourier Synthesis. (In English.) M. L. Hodgson, C. J. B. Clews, and W. Cochran. *Acta Crystallographica*, v. 2, Apr. 1949, p. 113-116.

11-176. A Photoelectric Device for the Evaluation of Structure Factors. (In English.) H. Lipson and C. A. Taylor. *Acta Crystallographica*, v. 2, Apr. 1949, p. 130.

Device and typical results.

11-177. Determination of an Isothermal Transformation Diagram With an Optical Dilatometer. J. K. L. Andersen. *Journal of the Iron and Steel Institute*, v. 162, May 1949, p. 29-32.

Determination for a Ni-Cr die steel, using a recording Leitz dilatometer equipped with a revolving casette. With this device accurate measurements of elongation as a function of time for undercooled austenite were made.

11-178. Experiences in the Study of Isothermal Transformations. T. F. Russell and C. Mavrocordatos. *Journal of the Iron and Steel Institute*, v. 162, May 1949, p. 33-43.

Part I describes an apparatus for exploratory work on isothermal transformations of slowly reacting steels by the magnetic method. Self-recorded diagrams showing temperature and magnetic change in transformations requiring hundreds of hours. Limitations of the apparatus. In Part II, coefficients of thermal contraction of a number of austenites down to temperatures near the M_s points, and change of length of the specimen during isothermal transformation for a number of hypo and hyper-eutectoid steels. The effect of carbon on these changes, and the relation of final length to that of an aggregate of ferrite and carbide.

11-179. Size-Surface Analysis of Finely Ground Mill Products by Elutriation. E. O. Lilge and D. E. Pickett. *Western Miner*, v. 22, May 1949, p. 44-47.

Results of experiments with conventional apparatus. Linear diameter in itself is not a suitable yardstick to use in metallurgical calculations. Surface area is shown to form a better basis for such calculations. 13 ref.

11-180. Stanford's Research Laboratories Tackle Industry's Gage Problems. *Western Metals*, v. 7, May 1949, p. 19-21.

Precision-gage laboratory.

11-181. Three-Inch Cupola Aids Study of Carbon Absorption. *American Foundryman*, v. 15, May 1949, p. 62.

Previously abstracted from *Pig Iron Rough Notes*, item 11-13, 1949.

11-182. Phase Contrast in Electron Microscope Images. E. G. Ramberg. *Journal of Applied Physics*, v. 20, May 1949, p. 441-444.

Intensity distribution in the in-focus and out-of-focus image of an edge of a transparent thin film introducing a prescribed phase change in the incident beam. It is found that the resulting "phase contrast" increases both with film thickness and with degree of defocusing and, for thin specimens, exceeds other sources of contrast in magnitude.

11-183. Improved Sectioning Technique for Electron Microscopy. Richard F. Baker and Daniel C. Pease. *Journal of Applied Physics*, v. 20, May 1949, p. 480.

Improved procedure makes possible cutting and mounting 0.05-micron sections with an ordinary microtome.

11-184. Magnetometer Indicates Drawing Quality of Steel. *Automotive Industries*, v. 100, May 15, 1949, p. 41, 108.

Instrument which measures and records automatically the mechanical torque exerted by a uniform magnetic field on a circular disk of sheet iron or steel to determine uniformity of its magnetic properties.

11-185. New Optics Keep Sharper Eyes on Costs. *Modern Industry*, v. 17, May 15, 1949, p. 114-116, 118, 120, 122.

Miscellaneous uses of optical instruments in industry.

11-186. Röntgenapparater för industriella ändamal. (X-Ray Apparatus for Industrial Applications.) W. Ask. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 65-70.

A new type of X-ray apparatus developed especially for industrial use in Sweden. Specifications of apparatus and of its construction.

11-187. The Mikrokator Amplifying Mechanism and Its Use in Measuring Lengths and Loads. H. Abramson. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 177-181.

Precision-gaging device is said to be particularly adapted for indicating and checking machine tools.

11-188. Auswertung von Oberflächenschichten durch ein neues Schliffverfahren. (Determining the Thickness

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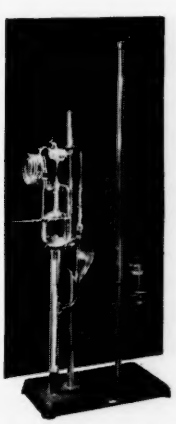

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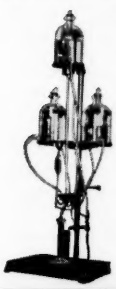

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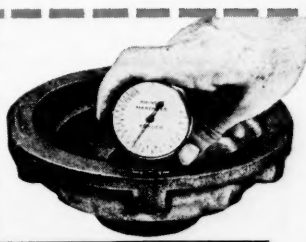

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of Surface Layers by a New Grinding Process.) H. Klemm. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 12-15.

New method.

11-189. Die Rauhigkeitswert-Bestimmung mit Hilfe des Flachschliffverfahrens. (Determining the Degree of Roughness With Aid of a Flat-Grinding Process.) H. Klemm. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 46-49.

The process is characterized by the fact that a plane is ground at a given angle to the surface to be investigated. The consequent enlargement of roughness depends on the angle of the "grind" to the investigated surface.

11-190. Gefugeanalytische geometrische Verfahren zur Bestimmung von Phasen unbekannter Zusammensetzung und ihrer chemischen Bindung. (Geometrical Method of Structure Analysis for Determining Phases of Unknown Composition and Their Chemical Bonding.) A. Schuller. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 73-75.

A petrographic method for determining the relative amounts of different phases in polynary systems. The microscopic instruments used for measuring the areas of different types of crystals. Examples of use.

11-191. On the Use of the Electron Reflector for Recording the Voltage Dispersion on the Surfaces of Metals and Semiconductors. (In German.) R. Orthuber. *Zeitschrift fur Angewandte Physik,* v. 1, Mar. 1948, p. 79-89.

A simple method of projecting the distribution of electrical potentials on metals and semiconductors onto a fluorescent screen in order to observe adsorbed foreign atoms on metal surfaces, electrical surface currents on semiconductors, potential patterns formed by photoelectric influences on semiconductor surfaces.

11-192. Uber Rauhigkeitsmessung mit dem Elektronenmikroskop. (Measuring Roughness With the Electron Microscope.) Robert Seeliger. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 170-172.

Method and its basic principles. Irregularities of 100 mμ or less can be accurately measured.

11-193. Uber den Temperatureinfluss bei Röntgenruckstrahlmessungen. (The Effect of Temperature on X-Ray Reflection Measurements.) Viktor Hauk and Eugen Osswald. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 190-192.

A simple formula for temperature correction of lattice constants and linear-expansion coefficients with temperature. Factors for Fe and Al alloys, with gold and silver as the calibrating substances.

11-194. Berucksichtigung der wahren Abbeugungsrichtung der Strahlen bei der Berechnung der Verformung und Spannung aus Röntgenruckstrahlaufnahmen. I. Berechnung von Spannung und Verformung aus einer Ruckstrahlaufnahme unter Verwendung der Differentialform des Braggschen Gesetzes. (Consideration of the True Direction of Ray Refraction in Calculation of Deformation and Stress From X-Ray Diffraction Patterns. I. Calculation of Stress and Deformation From Diffraction Patterns by Application of the Differential Form of Bragg's Law.) Gunter Kemmnitz. *Zeitschrift fur Metallkunde,* v. 39, Aug. 1948, p. 254-256.

Formulas for elongation, angle of shear, and stress used in calculating the above. The results are compared with earlier ones.

11-195. Röntgenprufung oder Olabkochprobe zur Feststellung von Feinlunkern bei Magnesiumguss? (Should X-Ray or "Oil-Boiling" Tests Be Used for Determining Micro-Piping in Magnesium Castings?) H. Reininger. *Metall,* July 1948, p. 220-223.

More expensive X-ray method is less reliable than the "oil-boiling" test.

11-196. Graphische Darstellung und Auswertung von Siebanalysen auf Grund der Rosin-Rammler-Gleichung. (Graphic Presentation and Evaluation of Sieve Analyses Based on the Rosin-Rammler Equation.) Edgar Puffe. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, July 1948, p. 97-103.

The equation is based on the theory of probability. It is valid primarily for uniformly ground materials such as coal dust, cement, and pigments. Sieve analysis, advantages, and applications.

11-197. The Spectrographic Examination of Localized Heterogeneity in Metals. (In English.) J. H. Oldfield. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 354-366.

The area affected by the spark discharge in spectrochemical analysis is usually very small. Consequently errors may arise as a result of local variation in sample composition. In order to minimize these errors, methods have been devised to increase the amount of sample affected by the discharge. Conversely, a reduction of the area affected allows more detailed study to be made of heterogeneity. A micro-spark technique was used for quantitative analysis of steel inclusions. Application to a wide variety of problems, including degree of diffusion of metals. A simple electrode holder which has considerably increased the accuracy of setting of the spark gap.

11-198. Verschleisskennwerte fur Zahnräder. (Characteristic Wear of Gear Wheels.) Heinz Glaubitz. *Archiv fur Technisches Messen,* Oct. 1948, T106, 2 p.

Methods for determination of the type and amount of gear-wheel wear.

11-199. A High Temperature X-Ray Diffraction Camera. James W. Edwards, Rudolph Speiser, and Herrick L. Johnston. *Review of Scientific Instruments,* v. 20, May 1949, p. 343-347.

Powder-diffraction camera designed to yield patterns at temperatures in excess of 2500° K. Preparation of sample. Camera is operated with a high vacuum or an inert-gas atmosphere.

11-200. An Apparatus for Producing Powder-Like X-Ray Diffraction Patterns From Single Crystals. F. W. Matthews and A. O. McIntosh. *Review of Scientific Instruments,* v. 20, May 1949, p. 365-366.

Gives results similar to an ordinary powder pattern. The standard X-ray powder index can be used.

11-201. Cells Drawn From Tantalum, Molybdenum, and Platinum for High Temperature Research. George W. Ziegler, Jr., Rudolph Speiser, and Herrick L. Johnston. *Review of Scientific Instruments,* v. 20, May 1949, p. 367.

Preparation.

11-202. The Statistical Nature of the Endurance Limit. J. T. Ransom and R. F. Mehl. *Journal of Metals,* v. 1, sec. 3, June 1949 (*Metal Transactions,* v. 185), p. 364-365.

Using a new abbreviated statistical method known as "staircase testing". Results are for SAE 4340 steel.

11-203. Experimental Work Employing Radioisotopes: Cobalt and Selenium. Don McCutcheon. *Non-Destructive Testing,* v. 7, Winter 1948-1949, p. 7-14.

Methods of ordering and applications. Laboratory setup, recommended tests, and a radioisotope thickness gage.

11-204. Possible Industrial Applications of Soft X-Radiation 15 to 100 Kilovolts. E. Dale Trout, R. M. Gager, and A. L. Pace. *Non-Destructive Testing,* v. 7, Winter 1948-1949, p. 20-24.

Physical characteristics of X-radiation from production models of equipment, using tubes of conventional design with beryllium windows. Compares results with previous experimental ones.

11-205. Industrial Uses of Radioisotopes—A Bibliography. *Iron Age,* v. 163, June 9, 1949, p. 60-61.

68 general-background, survey, mining and metallurgy, and miscellaneous references.

11-206. A Method of Examining Metallographic Specimens While Subjected to Fatigue Stresses. P. J. E. Forsyth. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, May 1949, p. 160-161.

Small vibrator designed for the above purpose and used in conjunction with a stroboscope.

11-207. Autographic Torque Magnetometer Aids Selection of Special-Purpose Steels. *Instruments,* v. 22, May, 1949, p. 436-439.

New electromagnetic instrument.

11-208. Report of Committee E-4 on Metallography. *American Society for Testing Materials,* Preprint 74, 1949, 16 pages.

Miscellaneous recommendations and proposed revised tentative methods for preparation of micrographs of metals and alloys, including recommended practice for photography as applied to metallography.

11-209. Application of Nuclear Radiation to Industry. John R. Menke. *Nucleonics,* v. 4, May 1949, p. 2-6.

Potentialities by following a typical life-history of a nuclear particle and by examining functions that it might perform at each step. 23 ref.

11-210. Differential Pressures; An Electrical Pressure Meter for Their Measurement on Open-Hearth Furnaces. S. S. Carlisle and B. O. Smith. *Iron and Steel,* v. 22, May 12, 1949, p. 206-209; discussion, p. 267-268.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 11-103, 1949.

11-211. An Apparatus for the Production of Large Metallic Crystals by Solidification at High Temperatures. Louis Gold. *U. S. Atomic Energy Commission,* AECD-2258, Sept. 2, 1948, 12 pages.

Previously abstracted from *Review of Scientific Instruments,* item 11-70, 1949.

11-212. La radiographie électronique et ses applications en métallurgie. (Electronic Radiography and Its Application in Metallurgy.) J. J. Trillat. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 79-83.

Improved methods for X-ray investigation of metals. The two methods (electronic radiography by reflection and by transmission) are particularly applicable for the study of metal surfaces, minerals, and castings. 15 ref.

11-213. Application de la spectrographie des rayons X a la physique des métaux. (Application of X-Ray Spectrography in the Study of the Physical Properties of Metals.) A. R. Weill. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 102-107.

Experimental method developed by Y. Cauchois for study of structures and phases. Data from a typical investigation of an Al-Cu alloy containing 4% Cu. 28 ref.

11-214. Etude des structures superficielles des métaux par les rayons X. (Study of Surface Structures of Metals by Means of X-Rays.) Ch. Legrand. *Revue de Métallurgie,* v. 46, Mar. 1949, p. 147-150; discussion, p. 150.

Proposes X-ray diffraction. Theoretical bases, apparatus settings, and optimum conditions of operation.

11-215. Comparaison entre l'examen de microdureté et l'examen de spectrographie locale pour l'étude de zones minces de diffusion. (Comparison Between Use of Microhardness Determination and Examination by Local Spectrography for Study of Thin Zones of Diffusion.) H. Buckle and A. Keil. *Metaux & Corrosion,* v. 24, Mar. 1949, p. 59-64.

Comparatively analyzes the above methods. Results of investigation of an Al-Cu-Mg allov indicate that microhardness determination is quite satisfactory. Microhardness is proportional to the copper content. Spectrographic examination, which is more accurate but also more complicated, may be used in doubtful cases. 12 ref.

11-216. Sur une méthode de haute sensibilité pour la détection micrographique des traces de déformations plastiques dans les alliages riches en cuivre. (A Method of High Sensitivity for the Detection, by Micrography, of Small Plastic Deformations in Copper-Rich Alloys.) Pierre A. Jacquet. *Comptes Rendus,* v. 228, Mar. 28, 1949, p. 1027-1029.

A new electrolytic method resulting in selective corrosion of deformed zones of the crystal structure of brass and Cu-Al alloys, subject to extremely small deformations. Optimum conditions of operation.

11-217. Production of Test Specimens From Silver Chloride for the Study of Stresses by an Optical Method. (In Russian.) S. O. Tsobkallo. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 338-345.

A method of producing polycrystalline AgCl sheets one-grain thick and also transparent AgCl bars. The pressing of AgCl strips and production of sheets one grain thick by recrystallization. Design of dies for pressing and optimum temperature and degree of deformation during recrystallization.

11-218. Quantitative Microstructural Analysis. (In Russian.) M. G. Smolovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 352-354.

Critically analyzes the formula of Blanter (v. 14, Apr. 1948) for determination of structural components and indicates that a grave error was made. Theoretical bases of proposed correction.

11-219. Method of Measuring Electromotive Force Induced During Friction and Wear. (In Russian.) M. L. Goldovskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 380.

Apparatus and its theoretical basis.

11-220. Die Empfindlichkeit bei der quantitativen Autoradiographie. (Sensitivity in Quantitative Autoradiography.) K. Zuber. *Helvetica Physica Acta,* v. 22, Apr. 20, 1949, p. 112-118.

Experiments made to determine the efficiency of photographic plates for quantitative determination of radioactivity as in tracer research. Results compared with measurements using counting tubes.

For additional annotations indexed in other sections, see:

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12 INSPECTION and STANDARDIZATION

12-99. Steel Compositions and Specifications From the Steel Producers Viewpoint. Charles M. Parker. *Blast Furnace and Steel Plant,* v. 37, May 1949, p. 553-557.

Abstracted from *Steel,* item 12-50, 1949.

12-100. Ultrasonic Testing of Tool Steels. James C. Hartley and Edgar K. Mull. *Iron Age,* v. 163, May 19, 1949, p. 80-85.

Results of an investigation which demonstrated the ability of ultrasonic testing to delineate segregation in high-speed steels and which indicated that the Reflectoscope can differentiate between mechanical defects and segregation. The feasibility of checking heat treatments by successive reflection counts.

12-101. Gaging 125 Valve Tappets Per Minute. Herbert Chase. *Iron Age,* v. 163, May 26, 1949, p. 66-69.

Coupled to the high-speed manufacturing set-up for valve push-rod bodies, described in the Feb. 3 issue, automatic gaging equipment keeps pace with production. Dome hardness of the tappet is checked along with squareness of the top, three diameters, and length.

12-102. Metallurgical Inspection of Castings. R. R. Senz. *Foundry,* v. 77, June 1949, p. 82-83, 246-248.

Destructive and nondestructive methods.

12-103. Standards of Length and Angle for Precision Engineering. H. Barrell. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 182-190.

Practical standards. Some methods and equipment used for relating the highest qualities of such standards to fundamental bases of linear and angular measurement. Angle standards of wedge and polygonal-block form, together with methods of self calibration, using an autocollimating telescope.

12-104. Uber Glasmesslehren. (Concerning Glass Gages.) V. Hruba. *Transactions, Instruments and Measurements Conference (Stockholm),* 1947, p. 194-202.

Use of glass instead of metal as material for precision fixed gages is said to be feasible. Advantages and different types. Methods of production.

12-105. A Comparator for High-Precision Measurements of Angles by the Interferometric Method. G. Cassinis. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 191-193.

New method based on an interferometric comparator of special design fitted with a set of angular gage blocks. By wringing together a few such blocks it is possible to get all angular values within a quadrant, and, in addition, values which are supplementary to the former, in steps of one second of arc.

12-106. Ein elektrisches Feinmessverfahren fur Bohrungen. (An Electrical Micro Method for Measuring Internal Diameters.) K. Potthoff and F. Keser. *Zeitschrift fur Angewandte Physik,* v. 1, Mar. 1948, p. 61-66.

Instrument for measuring inside diameters to an accuracy of $\pm 0.2\mu$.

12-107. Use of Fluorescent Intensifying Screens in Million-Volt Radiography. G. M. Corney. *Non-Destructive Testing.* v. 7, Winter 1948-1949, p. 17-19.

Properties of screens and use in industry.

12-108. Fluoroscopic Inspection of Aluminum and Magnesium Castings. 1. L. R. Curtis. *Non-Destructive Testing,* v. 7, Winter 1948-1949, p. 25-30.

Construction, calibration, and use of the fluoroscope. (To be continued.)

12-109. Detection of Incipient Drill Pipe Failure; Corrosion Fatigue Is Drill Pipe Enemy No. 1. Walter C. Main. *Drilling,* v. 10, June 1949, p. 63-64.

Mechanical caliper and gage tests, luminous-energy tests, magnetic-field tests, and their limitations.

12-110. How the New Thread Standard Affects You. Herman H. Lind. *Modern Machine Shop,* v. 22, June 1949, p. 146-148, 150, 152, 154.

12-111. Flaw Detection by Ultrasonic and Other Non-Destructive Methods. A. C. Rankin. *Journal of the West of Scotland Iron and Steel Institute,* v. 55, 1947-48, p. 69-114; discussion, p. 114-118.

Attention is primarily focused upon ultrasonic flaw detection, radiography, and magnetic crack detection. Principles, practical use, and operation of each. Relationships between the range of application of various tests. 12 ref.

12-112. Basic Interpretation of X-Ray Photographs of Pipe-Line Field Welding. R. R. Hughes. *Oil and Gas Journal,* v. 48, June 2, 1949, p. 55-57, 66.

How flaws were detected in welding big-inch pipe under actual construction. X-ray film interpretations and typical case histories.

12-113. High Speed Cine-Radiography. C. M. Slack, L. F. Ehrke, D. C. Dickson, and C. T. Zavales, *Non-Destructive Testing,* v. 7, Spring 1949, p. 7-11, 23.

Equipment and procedure for various applications.

12-114. A Nomogram for Computing Geometrical Unsharpness in Industrial Radiographs. Herman E. Seemann. *Non-Destructive Testing,* v. 7, Spring 1949, p. 12-15.

Factors which affect visibility of detail. Tests for determining the upper limit for geometrical unsharpness and a nomogram which may be used as a substitute for computing.

12-115. Microradiography. Rudolph Pospisil. *Non-Destructive Testing,* v. 7, Spring 1949, p. 16-18.

Reflection method.

12-116. Fluoroscopic Inspection of Aluminum and Magnesium Castings. L. R. Curtis. *Non-Destructive Testing,* v. 7, Spring 1949, p. 24-27.

Procedure and results of expediting production inspection by use of a front-surface mirror and of the inspection of 20,000 aircraft castings.

12-117. Non-Contacting X-Ray Thick-

ness Gages. H. S. Maxwell and C. W. Clapp. *Iron and Steel Engineer,* v. 26, May 1949, p. 70-74; discussion, p. 74-75.

Details of construction, operation, and advantages of above method for continuously gaging the thickness of hot rolled strip during production.

12-118. Stainless Steel Fasteners Normally Stocked. *American Machinist,* v. 93, June 2, 1949, p. 131.

12-119. Report of Committee B-6 on Die-Cast Metals and Alloys. *American Society for Testing Materials,* Preprint 13, 1949, 4 pages.

Includes proposed tentative specifications for zinc-base alloys in ingot form for die castings.

12-120. Important New and Revised Standards on Steel, Paint and Paint Materials, Plastics, and Non-Ferrous Metals. *ASTM Bulletin,* May 1949, p. 22-24.

12-121. Steel Products Manual. Sec. 1. Pig Iron and Blast Furnace Ferroalloys. Sec. 2. Semifinished Carbon Steel Products for Forging. Sec. 8. Hot Rolled Carbon Steel Bars. Sec. 10. Hot Rolled Alloy Steels. *American Iron and Steel Institute,* 1949. 22, 53, 91, and 111 pages.

Four of a series of paper-bound booklets punched for looseleaf binding. Standard grades, identification, testing, analysis, manufacturing procedures, metallurgical aspects, quality control, specifications.

12-122. Basic Problems in Construction of Devices for Control of Dimensions in the Machine-Tool Industry. (In Russian.) I. E. Gorodetskii. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Jan 1949, p. 16-18.

Various factors involved in the above. Different types of equipment and their combinations, as well as their applications to various cases.

12-123. Magnetic Method for Investigation of Steel Cables for Control of Their Quality. (In Russian.) V. S. Kravchenko. *Izvestiya Akademii Nauk. Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Feb. 1949, p. 283-291.

12-124. Application of Luminescent "Defectoscope" for Production Control. (In Russian.) M. Ya. Fuks. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 295-298.

Application of apparatus to detection of defects in nonferromagnetic-steel, light-alloy, and ceramic products. Details of method and its wide applicability.

12-125. Zerstörungsfreie Werkstoffprufung nach dem Magnetpulververfahren. II. Anwendung im Maschinen- und Motorenbau. (Nondestructive Testing of Materials by the Magnetic Powder Process. II. Its Use in the Construction of Machines and Motors.) E. A. W. Muller. *Archiv fur Technisches Messen,* Jan. 1949, p. T8-T10 (6 pages).

Use for detecting fatigue, grinding, and heat treatment cracks; slag inclusions, rolling defects. Instruments used. 16 ref.

12-126. (Book) **Proceedings of Fastener Manufacturers' Symposium.** 100 pages. American Institute of Bolt, Nut and Rivet Manufacturers, Hanna Bldg., Cleveland, O. $1.50.

Contains 13 papers regarding the American-British-Canadian unified screw threads. Historical background of the agreement, the new standards, and effects on fastener manufacture.

12-127. (Book) **Engineering Tolerances.** H. G. Conway. 286 pages. 1948. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W. C. 2, London, England. 30s.

Divided into three main parts: theory and practice; standard systems; miscellaneous production problems. The first part covers the fundamental theories of tolerance units, gaging and measurement, instrumentation, transition fits, oversize and undersize tools, press fits. Among standard systems described are manufacturing and installation limits for antifriction bearings, sintered bearings, oil seals. Under miscellaneous production problems such matters as rolling, stamping, drawing, extrusion, casting, plastic and rubber molding are discussed.

For additional annotations indexed in other sections, see:

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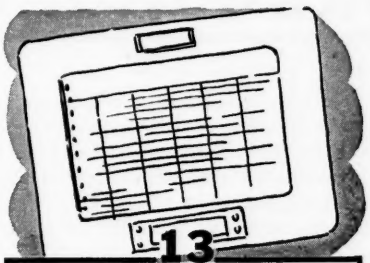


13 TEMPERATURE MEASUREMENT and CONTROL

13-38. Le réglage de la température. (Control of Temperature.) H. Bauer. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 445-458; discussion, p. 479-487.

Principles, apparatus, and applications.

13-39. Liquid Iron and Steel Temperatures in Practice. T. B. Winkler. *Blast Furnace and Steel Plant,* v. 37, May 1949, p. 536-542.

Design and use of Pt immersion thermocouples for study of liquid iron and steel temperatures at various stages in both the basic-electric and the basic openhearth steelmaking process. Temperature losses during such operations as transfer from blast furnace to openhearth, from furnace to pouring ladle, while standing in the ladle, etc.; also rate of increase of bath temperature vs. amount of fuel oil used per hr.

13-40. Automatic Temperature Control of Industrial Processes. E. B. Estabrook. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 139-145.

Classified into general types. Principles of construction from a nonmathematical point of view.

13-41. Process Reactions Encountered in Automatic Temperature Control Installations and Some Means of Maintaining the Desired Balance or Condition Within the Process With Reduced Lag. E. Ferner. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 146-149.

Schematic and circuit diagrams.

13-42. Temperature Measurements on Liquid Steel. S. Fornander. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 233-237.

Experiments made with the quick-immersion method. A pyrometer of British design for high-frequency induction furnaces gave good results with respect to reproducibility and accuracy. 80 measurements could be made with one and the same hot junction without any measurable change in e.m.f. For openhearth and electric-arc furnaces the design was also based on British models. Construction was changed in such a way that no parts are likely to give off gases when heated. Good reproducibility was obtained. 15 ref.

13-43. "Heat Inertia" in Problems of Automatic Control of Temperature. Part III. Actual Controllers. (Continued.) Victor Broida. *Instruments,* v. 22, May 1949, p. 406, 450, 452, 454, 456, 458.

Details of application of principles expounded in previous installments to positioning-type controllers. Present and potential applications of the new formulas.

13-44. High Speed, Thermocouple Temperature-Recording Equipment. E. J. Leaton. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, May 1949, p. 161-162.

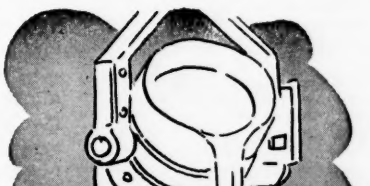
Apparatus has been used to record thermocouple readings at a rate of 8 per sec., with $\pm 2\%$ accuracy.

13-45. Optical Pyrometry; Influence of Smoke and Atmospheric Absorption in Steelworks. J. A. Hall. *Iron and Steel,* v. 22, May 12, 1949, p. 210-212.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 13-52, 1948.

13-46. Determination of Temperature of Salt Baths. (In Russian.) N. I. Brykushin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 374-375.

A special attachment for the radiation pyrometer which is said to assure accurate control of the salt-bath temperature up to 1280° C.



14 FOUNDRY PRACTICE

14A—General

14A-68. High Production Patterns. V. J. Sedlon. *American Foundryman,* v. 15, May 1949, p. 54-57.

Principles of pattern design, and methods of patternmaking, applicable to mass production. For small orders conventional methods are still satisfactory, but for long runs, use of modern methods is essential for reduction of time and costs.

14A-69. Wet System Reclaims Foundry Sand. Roy W. Bennett. *American Foundryman,* v. 15, May 1949, p. 58-61.

System and comparative cost analysis.

14A-70. Dielectric Core Baking. J. Wesley Cable. *American Foundryman,* v. 15, May 1949, p. 99-104.

Equipment, procedures, advantages, and applications.

14A-71. Heat Abstraction by Molding Materials. Thad T. Rick. *Foundry,* v. 77, June 1949, p. 96-97, 182, 184, 186, 188.

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14A-72. Procedure for Making Castings of Uniform Thickness From Block Patterns. *Foundry*, v. 77, June 1949, p. 121.

14A-73. Welding Rods Cast in Graphite Molds. *Foundry*, v. 77, June 1949, p. 220.

14A-74. Die neues Giesserei-Ultraschallgerät. (A New Ultrasonic Generator for Foundry Use.) Friedrich Vogel. *Metall*, July 1948, p. 229-230.

Metallographic examinations have shown that alloys melted under ultrasonic vibration produced by this generator have perfectly homogeneous and fine-grained structures.

14A-75. Views on Precision Casting. *Foundry Trade Journal*, v. 86, May 26, 1949, p. 501-503.

Summarizes paper by J. J. Marais and accompanying discussion, presented at February meeting of South American Branch of Institute of British Foundrymen. Clifford Shaw discussed use of ethyl silicate in the foundry.

14A-76. Les advantages de la recirculation des gaz chauds dans une étuve de fonderie. (Advantages of Hot Gas Recirculation in Mold Drying Ovens.) Pierre Rigaut and Georges Ulmer. *Fonderie*, Feb. 1949, p. 1491-1493.

Drying ovens with and without hot-gas recirculation were comparatively investigated for different types of fuel. On the basis of results, the above type of oven is particularly recommended when crude oil or gas is used and for electric drying.

14A-77. Die Kerntrocknung. (Core Drying.) Josef Kupper. *Die Neue Giesserei*, v. 36 (new ser., v. 2), Mar. 1949, p. 78-85.

A study of the behavior of different types of cores while drying and of various methods and types of core-drying equipment.

14A-78. Specialanlagen zur Trocknung von Giessereisand. (Special Plants for Drying Foundry Sand.) J. Kesper. *Archiv fur Metallkunde*, v. 3, Feb. 1949, p. 78-82.

Different types and their economic efficiency. Several modern sand-drying plants.

14A-79. (Book) **Bibliography on Precision Investment Casting by the Lost Wax Process.** ESL Bibliography No. 3, 1949, 15 pages. Engineering Societies Library, 29 West 39th St., New York 18, N. Y.

Annotated bibliography of 111 selected references up to early 1949, includes theory, design problems, specific industrial applications, and factory and production methods. Some historical references.

14A-80. (Book) **Osnovy Tsentrobezhnogo Lit'yr.** (Fundamentals of Centrifugal Casting.) P. G. Novikov, S. E. Rosenfeld, N. I. Klochnev, and V. N. Saveiko. 183 pages. 1947. Government Scientific-Technical Publishing House for Mechanical Engineering Literature, Moscow, U.S.S.R.

Compiled from domestic and foreign sources. The theory is analyzed. The influence of centrifugal force on the quality of finished products. Practical problems of centrifugal casting. 21 ref.

14B—Ferrous

14B-59. Modern Foundry Methods. *American Foundryman*, v. 15, May 1949, p. 74-76.

Methods for mass production of high-alloy-steel cylinders for jet-engine turbine rings by centrifugal casting process in permanent molds.

14B-60. Roll Founding—Some Physical and Metallurgical Factors. Part II. (Concluded.) W. G. Scott. *Blast Furnace and Steel Plant*, v. 37, May 1949, p. 550-552. Reprinted from Iron and Steel.

Effects of temperature, slag composition, and heat treatment.

14B-61. Centrifugally Casting Hollow Steel Ingots. *Iron Age*, v. 163, May 26, 1949, p. 81. Based on article in *Iron and Coal Trades Review*, Apr. 15, 1949, discussing a paper presented at the Sept. 1948 meeting of the German Iron and Steel Institute.

Centrifugal casting is said to be the most satisfactory method. Also describes other methods.

14B-62. Castings for Presses Cover Wide Range of Sizes. Edwin Bremer. *Foundry*, v. 77, June 1949, p. 92-95, 248-249.

Procedures, layout, and equipment for a wide variety of gray-iron castings for an extensive line of presses.

14B-63. Economies of Castings and Weldings. E. C. Moore. *Welding*, v. 17, May 1949, p. 196-200.

As applied to large machine frames.

14B-64. Construction of Cast Iron Equipment. II. J. Nixon Bewsher. *Industrial Chemist and Chemical Manufacturer*, v. 25, May 1949, p. 262-264.

Foundry difficulties caused by unsatisfactory designs, and appropriate remedies.

14B-65. Loam Moulding of an Evaporator-Body Casting. W. H. Hornby. *Foundry Trade Journal*, v. 86, May 12, 1949, p. 433-438, May 19, 1949, p. 461-463.

Method used for a large and complicated casting.

14B-66. Formtechniken und Formverfahren unter besonderer Berucksichtigung der Zementsandformerei. (Techniques and Methods of Molding With Special Emphasis on Molding With Cement Sand.) Karl Ingendahl. *Die Neue Giesserei*, v. 36, (new ser., v. 2), Mar. 1949, p. 74-78.

As applied to heavy ferrous castings.

14B-67. Estudo do dimensionamento dos canais de alimentacao das pecas fundidas. (Study of the Dimensions of Feeder Channels for Molds.) Carlos Dias Brosch and Octavio Longo. *Boletim da Associacao Brasileira de Metais*, v. 5, Jan. 1949, p. 41-56.

A method for calculation of optimum dimensions for casting of iron.

14C—Nonferrous

14C-45. Mass Methods Boost Rotor Output to 30 Times Pre-War. *Western Metals*, v. 7, May 1949, p. 26-27.

Die-casting and stamping operations used in production of motor rotors.

14C-46. The Mint, Birmingham: Brass and Copper Strip and Tube. N. H. Moseley. *Metal Industry*, v. 74, May 13, 1949, p. 379-382.

Casting, hot rolling, milling, and tube rolling.

14C-47. Some Examples of Modern Die Casting Technique. *Machinery* (London), v. 74, May 26, 1949, p. 698-703.

14C-48. Die-Casting Practice and Technique. XI. Basic Gravity Die Design (Multiple Form Blocks). W. M. Halliday. *Metal Industry*, v. 74, May 13, 1949, p. 387-389, May 20, 1949, p. 405-406.

Aligning by chase ring, location of chase ring, cavity formations, typical component design, determination of parting-lines, use of dowels, runner channels, and die-design modifications.

14C-49. Die-Casting Practice and Technique. XII. Basic Gravity Die Designs (Two Form Blocks). W. M. Halliday. *Metal Industry*, v. 74, May 27, 1949, p. 424-426.

Vertical and horizontal types, method of feeding, and advantages of above type.

14C-50. Fundamental Characteristics of Casting Fluidity. V. Kondic and H. J. Kozlowski. *Journal of the Institute of Metals*, v. 75, Apr. 1949, p. 665-678.

Novel apparatus used to study effects of degree of superheat, mold temperature, composition of certain binary alloys, and modification of Al-Si alloys on casting fluidity. A straight-line relationship between fluidity and absolute temperature was found for a number of pure metals. Certain previously established relationships between casting fluidity and composition of binary alloys were confirmed for the Pb-Sn and Al-Si systems. 12 ref.

14C-51. New Grid Casting Improves Battery Life. Eugene Willihnganz. *Iron Age*, v. 163, June 9, 1949, p. 62-65.

Development of a new grid design and improved casting techniques which are expected to result in substantial increases in service life of industrial storage batteries through the elimination of shrinkage porosity.

14C-52. Attaques et masselottes en fonderie de bronze et de laiton. (Sprues and Risers in Bronze and Brass Foundry Practice.) Joseph F. Nixon. *Fonderie*, Feb. 1949, p. 1465-1475; discussion, p. 1476-1477.

Influence on quality of finished castings. Other factors such as the human element.

14D—Light Metals

14D-28. Magnuminium Castings. F. McKenning. *Machinery Lloyd* (Overseas Edition), v. 21, Apr. 23, 1949, p. 80-84.

Production, properties, analysis and testing of above commercial Mg-Al alloys.

14D-29. Uber dinige Betriebserfahrungen in einem Aluminiumschmelzwerk. (Several Plant Experiences in an Aluminum Foundry.) G. Seumel. *Metall*, Oct. 1948, p. 324-325.

Desecribes and diagrams a furnace designed to melt and refine aluminum scrap especially from airplanes. A graph shows the range of iron content in a series of 301 melts.

14D-30. Points durs dans les alliages légers de fonderie. Aspects, compositions, causes remedes. (Hard Inclusions in Light-Alloy Castings. Nature, Composition, Causes, and Remedies.) Marcel Bardot and Guy Duport. *Fonderie*, Feb. 1949, p. 1478-1490; discussion, p. 1490.

Results of extensive investigation first in the laboratory, then on a commercial scale. Inclusions and their composition. Conclusions.

For additional annotations indexed in other sections, see:

19A-151; 19B-94; 19C-15

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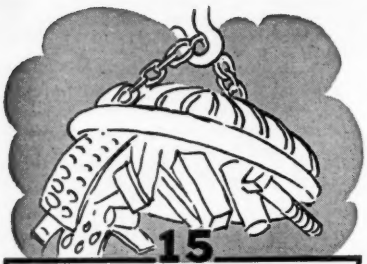


15 SCRAP and BYPRODUCT UTILIZATION

15-30. Uber die Entfernung von Kupfer-, Messing- und Bronzeuberzugen von Schrott und Abfall. (Removal of Copper, Brass, and Bronze Electroplating From Scrap.) E. T. Richards. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 137.

Mechanical, chemical, and galvanic methods.

15-31. Die Verarbeitung von Akkumulatorenruckständen. (Processing Storage Battery Scrap.) E. R. Thews. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 170-172.

Methods of salvaging lead and lead compounds from old storage batteries.

15-32. Technischer Stand und Entwicklungsrichtung der Leichtmetall-Schrottverarbeitung. (Industrial Status and Direction of Development in the Processing of Light-Metal Scrap.) Fritz Währer. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, Aug. 1948, p. 129-137.

Includes drawings of equipment and flow diagrams of processes.

15-33. Disposal of Plating Room Wastes. I. A. Critical Review of the Literature Pertaining to the Disposal of Waste Cyanide Solutions. (Continued.) Barnett F. Dodge and D. C. Reams. *Plating,* v. 36, June 1949, p. 571-577, 664.

(To be continued)

15-34. Mechanical Insert Repairs in the Steel Industry. R. L. Rectenwald. *Iron and Steel Engineer,* v. 26, May 1949, p. 76-81; discussion, p. 81.

Method for repair of large castings without disassembly, shrinkage fractures, or warpage.

15-35. Distillation of Zinc from Copper Base Alloys and Galvanizers Drosses. Frank F. Poland. *Journal of Metals,* v. 1, sec. 3, June 1949 *(Metal Transactions,* v. 185), p. 355-359.

Recent applications and improvements in procedure and equipment for recovery of Zn from secondary metals by means of high-temperature electric furnace distillation.

15-36. Cadmium Recovery Practice at the Donora Zinc Works. G. T. Smith and R. C. Moyer, *Journal of Metals,* v. 1, sec. 3, June 1949 *(Metal Transactions,* v. 185), p. 360-363.

Production procedure including raw materials, sulfating, purification, precipitation, briquetting, smelting, remelting, and recovery of rare metals.

15-37. New Facts on the Straightening of Welded Aircraft Structures. A. Y. Brodsky. *Engineers' Digest,* v. 10, May 1949, p. 165-167. Translated and condensed from *Avtogennoe Delo* (Welding), Aug. 1947, p. 14-19.

Previously abstracted from original, item 15-45, 1947.

15-38. Zwanzig Jahre reines Schrottverfahren mit Entwicklung vom Massenstahl zum Edelstahl. (Twenty Years of Pure Scrap Melting With the Development of Ordinary Low-Carbon Steel to High-Grade Steel.) Rudolf Hennecke. *Stahl und Eisen,* v. 69, Mar. 17, 1949, p. 181-186.

Experiences in the conversion of ferrous scrap to high-grade steel. Methods of refining steel by the scrap-carbon and slag-reduction processes, and in different types of furnaces.

15-39. Die Verwertung von gekörnten Haldenschlacken bei der Herstellung hydraulischer Bindemittel. (Utilizing Pulverized Waste Slags for the Production of Hydraulic Binders.) Gustav Mussgnug. *Stahl und Eisen,* v. 69, Apr. 28, 1949, p. 301-306.

As a substitute for cement and similar types of mortar. Recommendations are based on studies of chemical composition, physical condition, strength properties, water of hydration, and grindability.

15-40. Arbeiten der Duisburger Kupferhutte uber die technische Verwendung von Metallamalgamen. (Work With the Duisburg Copper Mill on the Industrial Use of Metal Amalgams.) Oskar Emert. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Feb. 1949, p. 47-55.

Process for extracting Zn as by-product from $ZnCl_2$ solutions in amalgam cells. Special properties of the amalgams (described in detail) make it possible to extract very pure Zn without previous refining of $ZnCl_2$ solution. Other metals, such as Pb and Mn, are obtained by electrolysis or exchange reactions.

15-41. Entwicklung der Aluminiumschrott-Raffination in der Dreischichtenelektrolyse. (Development of the Refinement of Aluminum Scrap by Triple Layer Electrolysis.) Werner Helling and Hans Lay. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Mar. 1949, p. 65-70.

Outlines history and describes and illustrates process in detail.

15-42. Verhalten von Zinn und Antimon beim Altmetall-Bessemern. (Behavior of Tin and Antimony in the Melting of Scrap Metal in the Bessemer Converter.) Wilhelm F. Kaiser. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Mar. 1949, p. 78-85

Experiments on the bessemerizing of bronze scrap with the object of refining the copper, of salvaging the greatest possible amount of tin, and of reducing the Sb content of the copper to a minimum.

15-43. Verfahren zum Ausschmelzen von zinkhaltigen Rucksstanden der Feuerverzinkungsanlagen. (Method of Recovering, by Melting, the Zinc in the Waste Products of Hot Galvanizing Plants.) Rolf Haarmann. *Metalloberfläche,* v. 3, Mar. 1949, p. 70-71.

Results.

15-44. Uber "Seigerdörner" aus der Dreischichten - Schmelzfluss - Elektrolyse des Reinst-Aluminiums und ihre Verwendung. ("Liquation Dross" From the Triple-Layer-Melt Electrolysis of High-Purity Aluminum and Its Use.) Hans Wolf. *Metall,* Apr. 1949, p. 116-118.

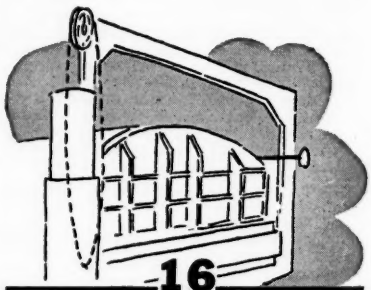
Five possible uses. 11 ref.

15-45. (Book) **Treatment and Disposal of Industrial Waste Waters.** B. A. Southgate. 327 pages. 1948. His Majesty's Stationery Office, London, England.

Effects of pollution of streams, general methods of treatment available, and special methods devised to solve problems of various industries. Treatment of sewage, coal mining, carbonization, pickling, paper mills, slaughter house, canning, and other industrial wastes.

15-46. (Book) **Metallurgical Working of Metal Scrap and Residues—White Metal Scrap. Vol. I.** (In German.) E. R. Thews. 355 pages. Carl Hanser Verlag, Leonhard-Eck-Strasse 7, 13b Munich 27, Germany. 22.50 DM.

Procurement and salvage of white metal scrap with the aim of promoting new methods and approaches.



16 FURNACES and HEATING DEVICES

16A—General

16A-43. Development in Electric Heating for Industrial Purposes. W. S. Gifford. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 193-228; discussion, p. 229-230.

British equipment and procedures.

16A-44. Elkem Rotating Hearth Furnace for Electrothermic Processes. Tonnes Ellefsen. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 308-330; discussion, p. 347-366.

Purpose is to avoid formation of melting craters around the electrodes, which cause heavy losses. Other advantages. Formation of craters in stationary furnaces, development of the rotating furnace, typical installations, formulas for maximum speed of rotation, economy, installation costs, and advantages of the rotating furnace.

16A-45. Outline of Electric Furnace Development. F. Thomlinson. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 231-242; discussion, p. 347-366.

With special reference to the various metallurgical applications.

16A-46. Perspectives du chauffage par induction dans la grosse industrie. (Prospects for Induction Heating in Heavy Industry.) A. R. Baffrey. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 379-387; discussion, p. 414-444.

Deals with above especially as applied to melting, refining, forging, tube butt-welding, and surface-hardening furnaces.

16A-47. High Frequency Heating in Industry. H. J. Meerkamp Van Embden, H. Van Suchtelen, and E. C. Witsenburg. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 394-407; discussion, p. 414-444.

Principles of inductive and capacitive heating and the chief applications.

16A-48. Production Induction Heating. W. E. Benninghoff. *Industrial Heat-*

ing, v. 16, May 1949, p. 792, 794, 796, 798, 800, 802, 804, 822.

Theory, procedures, equipment, advantages, and applications.

16A-49. Industrial Applications of Radiant and High Frequency Heating. D. E. Hayward. *Journal of the Imperial College Chemical Engineering Society*, v. 1, 1945, p. 50-53.

16A-50. Wämewirtschaft beim Gluhen und Härten. (Heat Economy in Annealing and Hardening Operations.) Egon Neuhäuser. *Stahl und Eisen*, v. 66-67, Oct. 9, 1947, p. 351-355.

A thorough analysis of the utilization of fuel in operation of heat treating furnaces. How large savings can be made by more efficient methods and equipment.

16A-51. Elektrisch beheizte Formguss-Kokillen. (Electrically Heated Ingot Molds.) F. Goederitz. *Archiv fur Metallkunde*, v. 2, Mar. 1948, p. 82-86.

Advantages and disadvantages. Arrangement used for an experimental mold of this type. Compares heat consumption and operation with gas-heated ingot molds. Practical experiments, and analysis of results.

16A-52. Eine Näherungslösung der Wärmeleitungsgleichung mit Anwendungen in der Wärmetechnik. (An Approximate Solution of the Equation of Heat Conduction and Its Technological Application.) J. Bingel. *Archiv fur Metallkunde*, v. 2, Mar. 1948, p. 106-107.

A theoretical, mathematical analysis.

16A-53. Some Applications of the High Frequency Induction Heating Process. J. C. Howard. *Metallurgia*, v. 40, May 1949, p. 37-43.

Principles involved, equipment used, and typical applications to heat treating, forging, brazing, and soldering.

16A-54. Some Recent Heat Treatment Furnace Installations; Progress in Design and Application. *Metallurgia*, v. 40, May 1949, p. 44-53.

16A-55. Heating Metal Slabs; Modern Walking-Beam Mill Furnace. M. van Marle. *Metal Industry*, v. 74, May 20, 1949, p. 403-404.

British installation.

16A-56. Water Cooled Cupolas. *Iron Age*, v. 163, June 9, 1949, p. 61.

New British development reported by W. H. Bamford in which water tanks are used in place of refractories for melting zones.

16A-57. Badanie wspolczynnika palnika "k" oraz przeplywu ciepla w piecach plomiennych. (Investigation of Burner Coefficient "k" and Heat Flow in a Fuel-Fired Furnace.) R. Dawidowski and T. Senkara. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 59-72.

Above coefficient was determined experimentally in presence of 23% excess air. Distribution of temperature of the waste gases and total coefficient of heat transmission to the cold charge. Special "calorimetric sounding rod" used. Part played by convection radiation from the walls.

16A-58. (Book) Transactions of the Second International Congress on Electroheat and Electrochemistry. (Compte-Rendu du Deuxieme Congres International sur l'Electrothermie et l'Electrochimie.) 503 pages. 1947. Nederlands Institut voor Electrowarmte en Electrochemie, Arnhem, Netherlands.

Held in The Hague, Sept. 3-4, 1947. Headings are in both English and French, also abstracts of the papers are in English, French, or German. Technical papers are divided into the following groups: general; low-temperature heating; industrial resistance furnaces; induction and high-frequency heating; measuring and regulating; and electrochemistry. Papers of metallurgical interest are abstracted separately.

16B—Ferrous

16B-63. Entwicklungsmöglichkeiten des electrischen Verhuttens. (Future Prospects for Electric Smelting.) Robert Durrer. *Nederlands Instituut voor Electrowarmte en Electrochemie*, "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 243-247; discussion, p. 347-366.

Under present conditions, above prospects for iron-ore smelting seem quite limited. However, the picture would be greatly changed if it were possible to transform the process so that the high-grade heat would only be used where absolutely necessary. These demands could be realized by combining a shaft-furnace with a rotary-furnace.

16B-64. Entwicklung der Hochofenprofile in verschiedenen Ländern. (Development of Blast Furnace Profiles in Different Countries.) Paul Wolf. *Stahl und Eisen*, v. 66-67, Dec. 4, 1947, p. 411-416.

Reasons for the different blast-furnace profiles. Shapes and dimensions. Statistical data.

16B-65. Oil-Firing Conversion; The Open-Hearth Furnaces at Park Gate Works. D. F. Marshall and H. C. White. *Iron and Steel*, v. 22, May 12, 1949, p. 197-205; discussion, p. 265-267.

Previously abstracted from *Journal of the Iron and Steel Institute*, item 16B-57, 1949.

16B-66. Dry-Coke Cooling; Application to Integrated Iron and Steel Works. L. H. W. Savage and A. V. Brancker. *Iron and Steel*, v. 22, May 12, 1949, p. 259-265.

Previously abstracted from *Journal of the Iron and Steel Institute*, item 16B-24, 1949.

16B-67. Oxygen as a Factor in Combustion of Fuel in the Open Hearth Furnace. D. D. Howat. *Journal of the West of Scotland Iron and Steel Institute*, v. 55, 1947-48, p. 176-221.

Quantitatively the effect of increase in available heat per unit volume of combustion gases, with consequent increase in temperature and radiating power of the flame, produced by employment of oxygen, on the downward heat flow from the flame and the net heat to the steel bath.

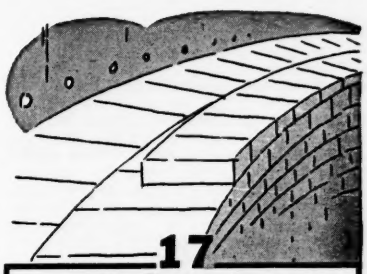
16B-68. Der Induktionskupolofen. (The Induction Cupola Furnace.) Eugen Piwowarsky. *Die Neue Giesserei*, v. 36 (new ser., v. 2), Apr. 1949, p. 104-106.

To overcome the difficulties caused by low coke quality, a combination of cupola furnace and high or low-frequency induction furnace is proposed, in which the inductively heated furnace hearth is charged with coke or other carburizing materials, or else with highly refractory noncarbonaceous substances. Experimental results and proposed equipment.

16B-69. Wplyw wielkosci ziaren mieszanek Weglowych na wlasnosci koksu wielkopiecowego. (Influence of Grain Size on Coal Blends on Blast-Furnace-Coke Properties.) M. Czyzewski and F. Byrtus. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 73-81.

Laboratory test made for determination of optimum conditions for coking in order to obtain blast-furnace coke of higher mechanical properties. Improvement in coke quality may be achieved by coking adequately selected blends which have a definite crushing strength.

For additional annotations indexed in other sections, see:
19B-107



17 REFRACTORIES and FURNACE MATERIALS

17-39. The Properties of Olivine and Its Uses for Refractories and Moulding Sands. Kristoffer Johannes Stenvik. *Journal of the Iron and Steel Institute*, v. 162, May 1949, p. 44-48.

Details of investigations, and the properties of forsterite are compared with those of other refractory materials. Experiments have also been made on olivine as a molding sand. It has a number of technical advantages over quartz, and it appears from animal tests that little or no silicosis hazard is involved.

17-40. Steel Mill Refractories and Masonry. *Industrial Heating*, v. 16, May 1949, p. 876, 878, 880, 882, 884.

Proceedings of session on above subject at 31st conference of National Open Hearth Steel Committee, and Blast Furnace, Coke Oven and Raw Materials Committee of AIME, Pittsburgh.

17-41. Study of a Slagged High Alumina Fire Brick. W. A. Lamberton. *Industrial Heating*, v. 16, May 1949, p. 886, 888.

From a naval boiler. The brick was cut into ten sections, from hot to cold end, and examined chemically, spectrographically, and by means of the X-ray, along with a control sample from an unused brick.

17-42. Some Factors Affecting Spalling of Fireclay Bricks. C. E. Moore. *Transactions of the British Ceramic Society*, v. 48, May 1949, p. 176-183; discussion, p. 183-185.

Review. Possible methods of overcoming this defect and lines of research.

17-43. Refractory Concrete. A. E. Williams. *Engineer*, v. 187, May 6, 1949, p. 496-498.

Its performance and applications.

17-44. Basische Zustellung fur Elektroöfendeckel. (Basic Linings for Electric Furnace Covers.) Robert Klesper *Stahl und Eisen*, v. 66-67, July 17, 1947, p. 241-243.

Different types of basic lining, including sillimanite, magnesite, and fireclay brick. Temperature expansion curves.

17-45. Uber stabile Dolomitsteine. (Concerning Stable Dolomite Bricks.) Kurd Endell. *Stahl und Eisen*, v. 66-67, Aug. 14, 1947, p. 290-293.

Methods of stabilizing calcium orthosilicate. Results of determination of the mineralogical and chemical structure of several test bricks. 10 ref.

17-46. Alte und neue Bindemittel aus Hochofenschlacke. (Old and New Binders Made From Blast Furnace

Slag.) Fritz Keil. *Stahl und Eisen,* v. 66-67, Dec. 4, 1947, p. 416-420.

Binding media in cements, mixed binders, and hydraulic limes; the development, properties and uses of mixed binders, slag binders, and gypsum slag cements. 18 ref.

17-47. Fours sidérurgiques construits en pisé de silice. (Metallurgical Furnaces With Silica Linings.) Antonio Scortecci and Francisco Savioli. *Revue de Métallurgie,* v. 46, Mar. 1949, p. 141-146; discussion, p. 146.

Composition and method of production of lining. Technique of application in different parts of the furnace. Mechanical properties and wear are compared with those of other commonly used lining materials.

17-48. Petrographic Characteristics of Basic Chrome-Magnesite Refractories. (In Russian.) D. S. Belyankin and B. V. Ivanov. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 51-58.

The mechanical properties as applied to linings for blast and other metallurgical furnaces at temperatures up to 2000° C. The low thermal stability and low temperature (1450-1550° C.) of the beginning deformation under stress. The mechanism of destruction of chrome-magnesite refractories is established and recommendations are made to obviate this disadvantage, mostly by changes in chemical composition.

17-49. Process of Production of High-Alumina Refractories on the Basis of the Synthesis of Mullite. (In Russian.) D. N. Poluboyarinov and R. Ya. Popil'skii. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 58-64.

Investigation led to establishment of basic conditions of production for refractories containing up to 60% Al_2O_3. Individual factors affecting heat resistance of these refractories. Applications.

17-50. Refractory Concretes With Increased Heat Resistance. (In Russian.) G. V. Kukolev and A. I. Roizen. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 65-76.

Proposes the use of heat resistant concretes containing alumina cement at temperatures up to 1250° C. Optimum compositions. Mechanical properties. Sphere of application.

17-51. Production of Dinas Bricks for the Crowns of Open-Hearth Furnaces. (In Russian.) Yu. P. Sidorenko and K. K. Tomash. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 77-84.

Method of production used in the USSR. Different factors involved and their influence on the quality of the final product. Optimum chemical compositions and conditions of production.

17-52. Problem of Wear of Heat Resisting Chrome-Magnesite in Crowns of Electric-Arc Steel Furnaces. (In Russian.) A. T. Kleinberg. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 85-90.

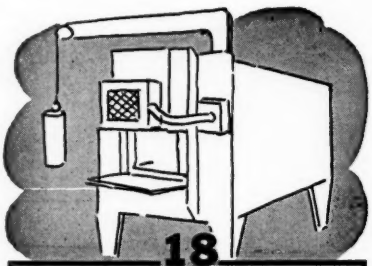
Changes undergone by heat-resisting chrome-magnesite during its service in above furnaces. Test specimens from the crowns of 4.5 and 15-ton electric furnaces. Factors increasing the life of these refractories.

17-53. The Preparation of Small Dense Thoria Crucibles. O. J. Whittemore, Jr. *U. S. Atomic Energy Commission,* AECD-2187, Dec. 1945, 5 pages.

Method using 2% zirconia as a flux. Crucibles are pressed from a composition containing a water-soluble wax as an internal body lubricant. Wax is then burned out and crucibles fired to 1800° C.

17-54. (Book) **The Thin-Section Mineralogy of Ceramic Materials.** G. R. Rigby. 179 pages. 1948. British Refractories Research Assoc., London, England.

Preparation of thin sections, identification of mineral phases, and optical properties of minerals found in ceramic materials, slags, glasses, and sinters. 56 ref.



18 HEAT TREATMENT

18A—General

18A-19. Compact, Versatile Heat Treating Shop of Cincinnati Shaper Co. *Industrial Heating,* v. 16, May 1949, p. 808, 810, 812, 814, 816, 822.

18A-20. A Simple Laboratory Test to Determine Data Necessary for the Production Heat-Treatment Process. James Mowat and John Sloan. *Journal of the West of Scotland Iron and Steel Institute,* v. 55, 1947-48, p. 141-160; discussion, p. 160-175.

"Refining Bar Test", so designed that practical information regarding heat treatment, range of hardness, ductility, and structure expected can be obtained. It consists of subjecting two standard bars, in different heat treated conditions, to a heat gradient in a specially designed furnace. Results are given in the form of graphs indicating the relation between Brinell hardness and the temperature from which the steel has been quenched subsequent to annealing treatment and at which it has been tempered after a previous hardening treatment.

18A-21. (Book) **La pratique des Traitements Thermiques des Métaux Industriels.** (Practical Heat Treatment of Commercial Metals.) Ed. 3. Gérard de Smet. 320 pages. 1949. Dunod, 92 rue Bonaparte, Paris 6, France.

Methods of production, chemical composition, and physical and chemical properties of metals and alloys, practical and simply presented methods and equipment for heat treatment. Theoretical aspects are largely omitted. A chapter on mechanical testing is appended.

18A-22. (Book) **Metal Working and Heat-Treatment Manual. Vol. III.** F. Johnson. 185 pages. Paul Elek Publishers, Ltd., 38 Hatton Garden, London, E. C. 1, England. 21s. net.

Carburizing processes indicating their applicability to specific types of steel. Gas carburizing and the cyanide process, nitriding, flame hardening, and induction hardening. Furnace atmospheres and surface protection during heat treatment of both ferrous and nonferrous metals.

18B—Ferrous

18B-89. Special Handling During Heat Treating Minimizes Distortion in Long Bars. F. H. Bremmer. *Industrial Heating,* v. 16, May 1949, p. 780-782, 784, 786, 788, 928.

New equipment for heat treating drill collars up to 54 ft. long.

18B-90. The Acceleration of the Rate of Isothermal Transformation of Austenite. M. D. Jepson and F. C. Thompson. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 49-56.

Part I describes the effect of fluctuating temperature, a marked decrease in transformation time being observed in the martensite range. Most of the transformation occurs during the cooling part of the temperature cycle. Part II deals with effect of stress on rate of isothermal transformation over a range of temperatures, both tensile and compressive stresses being investigated. A simple, rapid, and sufficiently accurate method of following the course of the transformation, by measuring the load required to break notched test-pieces.

18B-91. The Design and Operation of Annealing Plant for Mild-Steel Sheets and Coils. Part I. Metallurgical Aspects of Annealing. R. D. Pollard. **Part II. Developments in Annealing Equipment and Practice.** H. Edwards and J. F. R. Jones. **Part III. The Annealing of Mild-Steel Coils.** J. Bromley Davis. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 79-97.

18B-92. Graphitizing Behavior of White Iron. S. C. Massari. *American Foundryman,* v. 15, May 1949, p. 67-72.

Results of a study of iron of chilled-car-wheel composition, annealed at temperatures of 1600-2000° F. so as to complete first-stage graphitization. Approximate time required to complete first-stage graphitization and the type of graphite formed.

18B-93. Flame Hardening Large Gears. Paul A. Furkert. *Industrial Gas,* v. 27, May 1949, p. 13, 20-21.

Set-up developed.

18B-94. Liquid Salt Baths. Part II. (Concluded.) J. A. McElgin. *Canadian Metals and Metallurgical Industries,* v. 12, May 1949, p. 18-20, 29, 33, 35-38.

Procedures and equipment for heat treating, quenching, and martempering of tools and miscellaneous steel parts.

18B-95. Salt-Bath Chromizing. *Iron Age,* v. 163, May 26, 1949, p. 71-72. Condensed from paper by I. E. Campbell, V. D. Barth, R. F. Hoeckelman, and B. W. Gonser.

Chromizing by immersion of ferrous metals in fused salt baths containing 5-30% $CdCl_2$ was found to compare favorably with conventional pack methods both in over-all cost and in rate of case formation.

18B-96. Die Härtbarkeit und Vergutbarkeit der Stähle. (Hardenability and Temperability of Steel.) W. Gerber and U. Wyss. *Von Roll Mitteilungen,* v. 7, June-Sept. 1948, p. 13-49.

An extensive descriptive review of the literature. 83 ref.

18B-97. The Effect of Tempering on Tool and Die Steels. P. Payson. *Machinery* (London), v. 74, May 12, 1949, p. 626-628.

18B-98. Baffle-Box Method Reduces End-Hardening Costs. *Railway Engineering and Maintenance,* v. 45, June 1949, p. 577-578.

Method of heat treating rail ends in track with hand torches which includes baffle boxes to protect flame from the wind.

18B-99. Heat Treating for Dimensional Stabilization. *Iron Age,* v. 163, June 2, 1949, p. 76.

Special procedure developed by International Harvester for diesel-fuel-injection pumps.

18B-100. Induction Annealing of Light Steel Stampings Increases Production, Cuts Costs. H. R. Clauser. *Materials & Methods,* v. 29, June 1949, p. 51-53.

Selective annealing of critical

areas of small automotive stampings before or after forming to prevent cracking and restore ductility.

18B-101. Hardening Enhances Properties of Malleable Iron. Kenneth Rose. *Materials & Methods,* v. 29, June 1949, p. 56-58.

Malleable irons—particularly the pearlitic types—can be surface and locally hardened to improve wear resistance or increase strength.

18B-102. Practical Pointers on Steel Treating. Part VI. W. R. Bennett. *Modern Machine Shop,* v. 22, June 1949, p. 116-118, 120, 122, 124, 126, 128, 130.

Cold header dies, rehardening, oil hardening Mn steel, and quenching baths.

18B-103. Problems in Heat Treating. Part II. Growth and Distortion. Howard E. Boyer. *Steel Processing,* v. 35, May 1949, p. 257-260.

Concerned only with steel.

18B-104. Casehardening Steels in Cyanide-Containing Salt Baths. F. D. Waterfall. *Metallurgia,* v. 40, May 1949, p. 29-36, 43.

Conventional type is suited to production of case depths up to 0.025 in. and accelerated type for depths up to 0.09 in. Casehardening structures and effects of variables.

18B-105. Annealing of Steel Containing Small Amounts of Boron. (Some Problems of the Physics of Annealing.) (In Russian.) S. M. Vinarov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Feb. 1949, p. 243-250.

Investigated for steel containing 0.35-0.37% C, 0.20-0.23% Si, 0.50-0.67% Mn, and 0.001-0.1% B. Results indicate that steel containing 0.003-0.004% B is most readily annealed with simultaneous decrease in size of the austenite grains, contrary to general opinion. Attempts to explain this phenomenon.

18B-106. Aus der Walzhitze abgeschreckter unlegierter Baustahl St 52. (Unalloyed Structural Steel St 52 Quenched After Hot Rolling.) Franz Nehl. *Stahl und Eisen,* v. 69, Mar. 17, 1949, p. 186-194.

The effect of quenching on the strength properties of 0.20%-C steel, including the uniformity of strength during continuous production, and the effect of local heating on fatigue strength of welded beams.

18B-107. Druckluft als Kuhlmittel beim Patentieren von Stahldraht. (Compressed Air as a Cooling Agent in the Patenting of Steel Wire.) Wilhelm Pungel. *Stahl und Eisen,* v. 69, Apr. 14, 1949, p. 262-265.

Proposes substitution of compressed air for lead or salt baths. Process. Test results with wires of different composition. Structures of compressed-air-patented wires drawn at different rates.

18B-108. Auswirkung der Hartung aus der Walzhitze bei Vergutungsstahlen. (Hardening of Heat-Treated Steels Following Hot-Rolling.) Franz Bollenrath and Heinz Kiessler. *Stahl und Eisen,* v. 69, Apr. 28, 1949, p. 287-301; discussion, p. 301.

Known methods of tempering steels directly from the heat of hot working and their advantages and disadvantages. Cooperative research data indicate no basic improvement in strength properties over those obtained by ordinary heat treatment. However, other advantages are cited. 21 ref.

18B-109. Umelé atmosféry pro tepelné zpracovani ocele. (Prepared Atmospheres for Heat Treatment of Steel.) Bohuslav Holman. *Hutnické Listy,* v. 3, Dec. 1948, p. 362-366.

Coloring of steel in heating furnaces cannot be attributed to the influence of CO_2 and H_2O only. The CO-CO_2 ratio as determined by Heiligenstadt for hypo-eutectic steels is shown to change gradually to values derived by Holcroft for steels of higher carbon content. Comparison of Heiligenstadt's and Holcroft's data with those of Heyn on the carburization of steels in atmospheres of high hydrogen concentration proves that hydrogen influences the carburization potential of the atmosphere very slightly.

18B-110. (Book) **Steel and Its Heat Treatment. Vol III. Engineering and Special-Purpose Steels.** Ed. 5, D. K. Bullens and Metallurgical Staff of Battelle Memorial Institute. 606 pages. 1949. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y.

Effect on suitability of the different steels for various uses. Possibilities of utilizing alternate steels. Treating engineering alloys, constructional alloys, and special steels. (Vols. I and II were previously abstracted.)

18C—Nonferrous

18C-6. Ruckbildungsversuche an einer Kupfer-Beryllium-legierung. (Annealing Tests on a Copper-Beryllium Alloy.) H. Unkel. *Metall,* Oct. 1948, p. 319-324.

Effects of different annealing temperatures and times on the hardness, tensile strength, yield point, elongation, and specific resistance of drawn, forged, hot and cold rolled samples of a Be-Ni-Cu alloy. 10 ref.

18D—Light Metals

18D-8. The Influence of Over-Ageing and Annealing on the Hardness and Microstructure of an Aluminium Alloy to British Standard Specification L42. W. Betteridge, C. Wilson, M. A. Haughton, and W. Morgan. *Journal of the Institute of Metals,* v. 75, Apr. 1949, p. 641-664.

Effects of temperatures between 150 and 400° C. were investigated, with the object of deriving the operating temperature of engine components from subsequent hardness and microscopic determination. Variations of lattice parameter with change in annealing conditions. Results support a tentative explanation of the various phenomena based on present theories of age-hardening.

18D-9. La funzione del tempo di preriscaldo nella tempra di soluzione delle leghe leggere da fonderia. (Duration of Preheating in Solution Quenching of Cast Light Alloys.) C. Panseri. *Alluminio,* v. 18, Jan.-Feb. 1949, p. 7-20.

Test results for Al-Si-Mg, Al-Cu-Si, and Al-Cu-Fe-Mg cast alloys, showing the effect of the above on mechanical properties. Attempts to find a theoretical explanation of the curves of these properties vs. duration of preheating.

For additional annotations indexed in other sections, see:
3B-123-125-127-128; 4B-58; 4D-33; 16A-50-53-54; 19B-103

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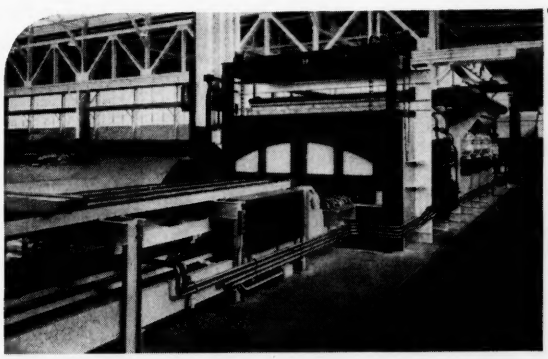

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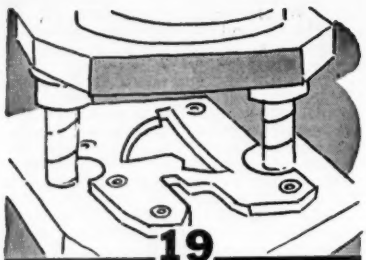


19 WORKING

19A—General

19A-130. Press Brake With Tangent Bender Forms Metal Cabinets Complete. *Modern Industrial Press,* v. 11, May 1949, p. 6, 8, 10, 44.

19A-131. Presses Play Big Part in Quantity Production of Control Parts. Fred M. Burt. *Modern Industrial Press,* v. 11, May 1949, p. 40, 42, 44.

Equipment for manufacture of a wide variety of automatic pressure, temperature, and flow controllers.

19A-132. Shot Peening Process Now Part of Regular Production Operations in Many Industries. Rick Mansell. *Modern Industrial Press,* v. 11, May 1949, p. 46, 48, 50, 52.

Equipment, procedures, and miscellaneous applications.

19A-133. Stress-Strain Relationship in High-Temperature Alloys. *Industrial Heating,* v. 16, May 1949, p. 824.

Summarizes recent paper by John F. Tyrell. Relationship between stress and strain in the plastic range before necking begins is one of the factors which determine formability characteristics.

19A-134. Spanlose Werkstofformung und Bauteilgestaltung in der Feinwerktechnik. (Chip-Free Forming of Materials and Design for Precision Work.) K. H. Sieker. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 87-93.

Methods of working and shaping materials with forming and shearing tools and dies; pressing and diecasting of synthetics; and production of parts by powder-metallurgical methods.

19A-135. Double Combination Die for Producing Two Different Parts. B. Menkin. *Machinery* (London), v. 74, May 19, 1949, p. 662-663.

A rim shell is blanked and drawn and a pronged collet is simultaneously formed and pierced on the double combination die. Details of the process.

19A-136. Cold Roll Forming of Sheet and Strip. E. J. Vanderploeg. *American Society of Mechanical Engineers,* Paper No. 49-S-3, 1949, 13 pages.

Various types of machines and products made on them. Accessory equipment. Operation of machines and production.

19A-137. Modern Seamless Tube Mills. William Rodder. *Iron and Steel Engineer,* v. 26, May 1949, p. 86-94.

Modernization of component units used in the plug-mill type of seamless-tube mill. Calculation details.

19A-138. Springs Control Forging Hammer Vibration. Rolt Hammond. *American Machinist,* v. 93, June 2, 1949, p. 98-100.

British installation.

19A-139. Roll Formed Exterior Trim. Howard A. Burleson. *Western Machinery and Steel World,* v. 40, May 1949, p. 90-91.

Fabrication of chromium-plated or stainless-steel trim strips.

19A-140. An Analysis of Blanking Die Designs. Part III. C. W. Hinman. *Modern Machine Shop,* v. 22, June 1949, p. 106-108, 110, 112.

19A-141. Seven Dies Operated Simultaneously on a Large Hydraulic Press. George H. DeGroat. *Machinery,* v. 55, June 1949, p. 167-170.

Production of embossed escutcheon for electric range. The stamping operations performed include blanking, embossing, trimming, and piercing.

19A-142. Fundamental Principles of Drawing Dies. (Concluded.) C. W. Hinman. *Machine and Tool Blue Book,* v. 45, June 1949, p. 114-118, 120.

Press design, methods to be followed in designing a double-action die, and operation of the die.

19A-143. Progressive Drawing Die Design. Hans Effgen. *Tool & Die Journal,* v. 15, June 1949, p. 42-45, 82, 84.

Some basic characteristics. Calculation of reductions for circular parts.

19A-144. Fitting the Drawing Compound to the Job. M. J. Murphy, Jr. *Tool & Die Journal,* v. 15, June 1949, p. 48, 50.

Factors to be considered in evaluating work and selecting drawing compounds.

19A-145. The Use of Inclinable Punch Presses. J. I. Karash. *Tool & Die Journal,* v. 15, June 1949, p. 54, 56, 58, 60, 78, 80.

Safety and efficiency gained from proper use. Common misuses and peculiar features of die design.

19A-146. High-Production Presses for Short Runs. *Tool & Die Journal,* v. 15, June 1949, p. 64, 66.

Five Bliss automatics and their adaptation for short runs of different stampings.

19A-147. Harmonic Stock Feed Accessory for Multipress Presses. *Tool & Die Journal,* v. 15, June 1949, p. 74, 76.

Its operation.

19A-148. Trimming Tool Design. E. W. Mace. *Steel Processing,* v. 35, May 1949, p. 248-249.

Tools for removal of "flash"—surplus metal remaining after forging.

19A-149. Value of Surface-Active Lubricating-Cooling Liquids in the Deep Drawing of Metals. (In Russian.) S. Ya. Veiler and L. A. Shreiner. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Jan. 1949, p. 84-87.

New method for evaluating lubricating action. Comparative data on different cooling lubricants.

19A-150. Neue Bauart einer kontinuierlichen Knuppelstrasse. (A New Design of Continuous Billet Mill.) Theodor Dahl. *Stahl und Eisen,* v. 69, Mar. 17, 1949, p. 195-196.

19A-151. Neuere Fabrikationsmethoden und Befestigungsarten von Gasturbinenschaufeln. (Recent Methods of Manufacturing Gas Turbine Blades and Methods of Attaching Them to the Rotors.) E. J. Meier-Tondury. *Schweizer Archiv fur Angewandte Wissenschaft und Technik,* v. 15, Mar. 1949, p. 65-75.

Drop forging, precision casting, and machining of the blades, with special emphasis on English and American trends.

19A-152. Tiefziehen dunner Bleche mit Sonderwerkzeugen. (Deep-Drawing of Thin Sheet Metals With Special Tools.) Helmut Beisswanger. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 101-115.

With emphasis on the factors (type, thickness, and properties of the metals, punch-and-die design) that determine the success or failure of the operation. 14 ref.

19B—Ferrous

19B-85. "Presses" Prove to Be Principal Tools at Fentron Steel Works. Howard E. Jackson. *Modern Industrial Press,* v. 11, May 1949, p. 13-14, 18, 38.

Seattle firm makes steel and aluminum frame windows; hollow metal doors and door frames; louvers and screen sections used in connection with the doors and windows; and complete service-station buildings and warehouses.

19B-86. "American Kitchens" Embody Many Press Techniques. Walter Rudolph. *Modern Industrial Press,* v. 11, May 1949, p. 22, 26, 28.

Production of steel kitchen equipment.

19B-87. Advanced Engineering Methods Step-up Production at Fowler Manufacturing Co. Gerald E. Stedman. *Modern Industrial Press,* v. 11, May 1949, p. 32, 34, 36, 38.

Forming and finishing procedures and equipment for manufacture of electric water heaters; foundry equipment; industrial cleaning apparatus; and demonstration trailers.

19B-88. Frost Wire Drawers and Weavers Continent Leaders. David C. McConnell. *Canadian Metals and Metallurgical Industries,* v. 12, May 1949, p. 14-17, 31-32.

Procedures and equipment for wire drawing, cleaning, galvanizing, and weaving of wire cloth.

19B-89. Auto Makers Find Supply Source in Bumper Crop. *Western Metals,* v. 7, May 1949, p. 28-29.

Production of automobile bumpers.

19B-90. Evolution of the Reversing Hot Strip Mill. T. W. Lippert. *Iron Age,* v. 163, May 19, 1949, p. 86-89.

19B-91. Crucible Opens Ultra Modern Mill. *Iron Age,* v. 163, May 19, 1949, p. 90-93.

New $18,000,000 stainless and alloy strip steel plant.

19B-92. Alloy Strip Hot Coiled During Reversing Passes at Crucible's Midland Works. *Steel,* v. 124, May 23, 1949, p. 94-96, 106, 108, 111.

Reels operating in overhead gas-fired furnace on either side of mill serve the new 66-in., 4-high reversing hot strip mill. Modern facilities for cold finishing stainless steels.

19B-93. Seigerungsverlagerung und Verformung beim Walzen von weichem Stahl nach Untersuchungen an einer Drahtstrasse. (Segregation Displacement and Deformation in the Rolling of Soft Steel on the Basis of Investigations in a Wire-Rod Rolling Mill.) Kurt Krebs. *Stahl und Eisen,* v. 66-67, July 17, 1947, p. 244-250.

Results of a systematic investigation into the causes of defects (brittleness, poor drawing properties, cracking, rough surface) in soft rolled steel wire which became apparent when the wire was converted into screws, rivets. 11 ref.

19B-94. Einfluss der Giess- und Walzbedingungen auf die Fussrissanfälligkeit von Schienen S 49. (Effect of Casting and Rolling Conditions on the Susceptibility of S-49 Rail Flanges to Cracking.) Walter Jäniche. *Stahl und Eisen,* v. 66-67, Aug. 14, 1947, p. 284-290.

Susceptibility depends greatly on the method of rolling, but very little on the method of casting. Structures of flanges rolled by three different methods; and welded and unwelded surface cracks. S-49 is a standard type rail used in Germany.

19B-95. Das Blockwalzen. (Bloom Rolling.) Mathieu Holzweiler. *Stahl*

und Eisen, v. 66-67, Sept. 11, 1947, p. 315-318.

Importance of the above to the surface condition of the finished rolled product. Construction and calibration of 22 blooming mills compared; importance of edge sharpness of the grooves; examples of different types of grooves.

19B-96. Production of Plates. W. Louis Bunting. *Steel,* v. 124, May 23, 1949, p. 114, 116, 119-120, 122, 125-126, 128; May 30, 1949, p. 70, 72-73, 76, 78, 80, 83-84, 86.

Equipment and procedure for manufacture of steel plates.

19B-97. Loop Forming Cold Drawn Steel Strips, Using Tangent and Hydraulic Forming Machines. H. J. Hunter. *Steel,* v. 124, May 30, 1949, p. 59, 68.

Procedure used in three models of automatic pickup hay balers.

19B-98. Combination Die Produces 118% Faster. Walter J. Mahany. *American Machinist,* v. 93, June 2, 1949, p. 101.

Crimped gutters are now made from drum-head shearings in one operation instead of four. With a progressive die, blanking and forming are now done on one press, and the shearing operation is eliminated.

19B-99. Automatic Transfer Presses Increase Stamping Output. E. E. Schroeder. *Iron Age,* v. 163, June 2, 1949, p. 60-66.

Verson transfer-feed presses for stamping range drawers, reflector rings, and drip pans for Hotpoint electric ranges.

19B-100. Ingenuity in Press Operation Affords Fabrication Savings. James M. Herendeen. *Steel,* v. 124, June 6, 1949, p. 120, 123.

Use of presses in fabrication of heavy equipment.

19B-101. French Wire Production; Equipment and Methods Described. W. A. Sandilands. *Wire Industry,* v. 16, May 1949, p. 421-423, 425.

Based on a tour by a British wire manufacturer's research manager.

19B-102. Press Work at General. Elmer L. Lipp. *Western Machinery and Steel World,* v. 40, May 1949, p. 98-99.

Fabrication of car accessories by the General Machine Works.

19B-103. Forging and Heat Treating of Sucker Rods Used in Oil Wells. *Iron and Steel Engineer,* v. 26, May 1949, p. 113-114.

19B-104. Compressed Air—An Important Aid in Forming Operations. Bartlett West. *Modern Machine Shop,* v. 22, June 1949, p. 134-136, 138, 140, 142.

Varied uses.

19B-105. Flexibility of Sheet Metal Operations Geared to "Mass-Produce" Diversified Tractor Components in Short-Run Lots. E. F. Ross. *Steel,* v. 124, June 13, 1949, p. 80-83, 120, 122.

Press equipment and procedures for gas-tank halves, hoods, grille fronts, grille tops, fenders, oil pans, flywheel dust shields, and drawbars.

19B-106. Hot Rolled Breakdowns Produced in Converted Geneva Plate Mill. *Steel,* v. 124, June 13, 1949, p. 106, 108.

19B-107. Process for Hot Drawing Wire Gives Excellent Physical Properties and Eliminates Repeated Annealing and Pickling Operations. Rheinhold Schempp. *Steel,* v. 124, June 13, 1949, p. 116, 118.

Hot-drawing equipment consists of a pay-off reel, a gas-fired lead bath in the form of a tube with gooseneck ends, automatic lubrication by means of a graphite spray between the exit of the lead bath and the drawing die, and the usual wire-drawing block with die holders and rotating variable-speed drum.

19B-108. Transfer Type Presses Speed Output of Electric Ranges. B. E. Schroeder. *Machinery,* v. 55, June 1949, p. 149-154.

Unusual mass-production techniques and welding procedures.

19B-109. Punching 1045 Hot Rolled Steel Tractor Draw Bars. *Tool & Die Journal,* v. 15, June 1949, p. 62-63.

A 1000-ton punching machine and other punching equipment installed to increase production.

19B-110. Economies in Refrigerator Cabinet Production. *Tool & Die Journal,* v. 15, June 1949, p. 87-88.

Combining a press brake and a tangent bender permits complete forming without welding.

19B-111. Automatic Forming From Flat Blanks to Final Complex Shape Performed on Bath "Multibenders". *Tool & Die Journal,* v. 15, June 1949, p. 88.

Procedure used.

19B-112. Précontraintes et durcissement superficiel des pieces d'acier. (Prestraining and Surface Hardening of Steel Pieces.) J. Pomey. *Revue de Métallurgie,* v. 46, Jan. 1949, p. 46-54; Feb. 1949, p. 108-120; Mar. 1949, p. 163-180.

Modern theories of the straining process. Different methods of prestraining resulting in surface hardening and different factors involved in the process. 44 ref.

19B-113. Abkantungen und Abrundungen beim Walzenkalibrieren. (Bevelling and Rounding the Edges in the Grooving of Rolls.) Adolf E. Lendl. *Stahl und Eisen,* v. 69, Apr. 28, 1949, p. 306-308.

A method of calculating the "critical" bevel and the necessary bevel required to prevent formation of fins in box grooves.

19B-114. Gniot, wydluzenie i roztlaczanie w procesie walcowania na gorqco. (Draft, Spread, and Elongation in the Hot Rolling Process.) Z. Wusatowski. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 27-58.

Improved formulas as applied to steel. 37 ref.

19C—Nonferrous

19C-15. A Century of Progress: Activities of the Birmingham Battery and Metal Co., Ltd. D. W. D. Showell. *Metal Industry,* v. 74, May 27, 1949, p. 419-422.

Manufacture of Cu-base tubes, sheets, plates, rods, and wire. Refining, casting, hot and cold rolling, rotary piercing, extrusion, reducing, and tube drawing, the wire mill, and the laboratories.

19D—Light Metals

19D-39. Hot Dimpling Magnesium Sheet. H. R. Carns. *Automotive Industries,* v. 100, May 15, 1949, p. 42-43, 98, 100, 102.

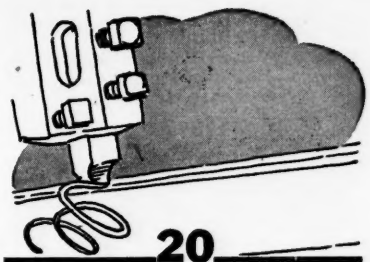
Compares the direct-resistance and the conduction method. Latter is more satisfactory for production work.

19D-40. Duralumin Extrusion and Rolling. D. H. H. Clarke. *Metal Industry,* v. 74, May 20, 1949, p. 399-402.

Practice at one company.

For additional annotations indexed in other sections, see:

3A-125; 3D-43; 4D-33; 7B-111; 16A-53; 22B-207



20 MACHINING and MACHINABILITY

20A—General

20A-231. Machine Tool Lubrication on the Production Line. *Lubrication,* v. 35, May 1949, p. 49-60.

Lubrication systems for machine tools. Lubricant recommendations and a simplified lubrication plan.

20A-232. Automatic Systems Will Boost Tomorrow's Auto Production. Don G. Gumpertz. *Western Metals,* v. 7, May 1949, p. 24-25.

As observed in an Eastern automobile factory. Answers series of questions which are usually asked by interested executives.

20A-233. Precision Production of Chris-Craft Outboard Motors. Joseph Geschelin. *Automotive Industries,* v. 100, May 15, 1949, p. 26-28, 104.

Machine-shop methods and apparatus used for finishing the various parts, including Meehanite-iron flywheel and numerous Al-alloy precision die castings.

20A-234. Methods of Measurement in Machinability Research. O. E. Svahn. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 123-128.

Methods used at Royal Swedish Institute of Technology, Stockholm, Sweden.

20A-235. Air Operation of Machines. *Machinery* (London), v. 74, May 12, 1949, p. 622-625.

Several applications to machine tools.

20A-236. Back to Cams Again. E. J. Tangerman. *American Machinist,* v. 93, June 2, 1949, p. 105.

New Bryant internal automatic grinder stripped of all hydraulic and electronic devices. All elements are cam operated.

20A-237. Practical Ideas. *American Machinist,* v. 93, June 2, 1949, p. 112-116.

Includes the following: multiple-spindle drilling added to turret lathe (R. G. Dickens); depth-gage attachment scribes layout lines (Eugene Dietz); springs cushion worm shock (Chester S. Ricker); staggered construction improves magnetic blocks (Allan B. Nixon); drill-in-spindle setup pierces long stock (Michael P. Blake); drilling fixture speeds setup and location (E. C. Schlenker); pin holder aids sheet-metal layout (Gerhard Wenke); shearing punch deburrs cams (John K. Lukacs); double-bend tool turns casting trunnions (C. L. Bossmeyer); jig boring method improves accuracy on old machines (Norman A. Benson); and other miscellaneous shop hints.

20A-238. Horsepower for Turning and Boring With Carbide. *American Machinist,* v. 93, June 2, 1949, p. 127.

20A-239. Grinding With Formed or Multiple Wheels. J. F. Fischer. *Modern Machine Shop,* v. 22, June 1949, p. 98-102.

A number of the more important factors to be considered in the selection of a method.

20A-240. Modern Equipment at Work. *Modern Machine Shop,* v. 22, June 1949, p. 194, 196, 198, 200, 202, 204, 206, 208, 210.

Changes in hob design and manufacturing methods solve problem of noisy gears; Sundstrand Rigidmil for milling cylinder heads; valve body machined with Cincinnati boring mill, truck axles machined with LeMaire special machine; Airco No. 394 for welding mower blades.

20A-241. Ideas From Readers. *Modern Machine Shop,* v. 22, June 1949, p. 212, 214, 216, 218, 220, 222.

"Geared Collet Chuck", Clifford T. Bower; "Method of Reversing Hot Workpieces", B. A. Lee; "Bending Device for Small Parts", R. H. Dauterich; "Uses for Old Files", A. H. Waychoff; and "Versatile Indicator Holder", John C. Mottl, Jr.

20A-242. The Shaper as a Manufacturing Tool. J. J. Murphy. *Machinery,* v. 55, June 1949, p. 155-158.

Some examples of effective applications.

20A-243. How to Estimate Machining Costs in the Job Shop. Herbert W. Brown. *Machinery,* v. 55, June 1949, p. 159-164, 166.

First of a series that will cover all basic types of machine tools. A practical method of estimating the cost of planer jobs.

20A-244. Machining Sintered Powdered-Metal Bearing Materials. E. J. Weller. *Machinery,* v. 55, June 1949, p. 181-184.

Recommended procedures. Design of carbide-tipped tools for the operation.

20A-245. Production Jig Boring to Close Tolerances. George H. DeGroat. *Machinery,* v. 55, June 1949, p. 185-187.

Typical production job using a jig-boring machine. Shift from boring mill reduced time from 3½ hr. to 22 min. per piece.

20A-246. Tool Engineering Ideas. *Machinery,* v. 55, June 1949, p. 207-210.

"Simple Method of Making Die Shedders or Strippers", Cliff Bossmann; and "Indexing Drill Jig for Radial and Longitudinal Location", L. Kasper.

20A-247. Electromagnetic Clutches Simplify Machine Control. James A. Mason and L. A. Leifer. *Machine Design,* v. 21, June 1949, p. 107-110.

Turret lathe in which the above have produced a faster and safer semi-automatic machine tool.

20A-248. Toolroom Methods Can Increase Manufacturing Production. *Tool & Die Journal,* v. 15, June 1949, p. 90, 92.

Experience using Moore Panto-Crush Wheeldressers.

20A-249. Grinding Fine-Pitch Gears. A. S. Beam. *Journal of the American Society of Naval Engineers,* v. 61, May 1949, p. 464-468. Reprinted from *Machinery,* v. 55, Dec. 1948.

Previously abstracted from original, item 20a-449, 1948.

20A-250. Novel Facing Tool for Radial Drills. *Engineers' Digest,* v. 10, May 1949, p. 174. Translated and condensed from *Werkstatt und Betrieb,* v. 82, Jan. 1949, p. 13.

20A-251. Bigger and Better Spun Heads. *Lukens Plate,* v. 11, no. 1, [1949], p. 2-5.

276-in. flanging machine, at Lukens, capable of spinning heads in diameters up to 20 ft., 6 in.

20A-252. Duplicating Mechanisms for Lathes for Machining Surfaces of Non-Circular Form. (In Russian.) M. B. Tumarkin. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Feb. 1949, p. 7-12.

Factors to be considered in their design. Applications and optimum conditions of operation.

20A-253. Influence of Type of Grain and Binding Agent of the Abrasive Wheel on Grinding and Polishing of Metals. (In Russian.) N. I. Volskii. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Feb. 1949, p. 18-20.

Relative merits of corundum and carborundum as metal abrasives. Differences between them are explained on the basis of type and size of grains and of varying characteristics of the bonding agents.

20A-254. (Book) **Werkstattkniffe, Vorrichtungsbau.** (Workshop Hints, Jigs and Fixtures.) Hans E. Scheibe. 84 pages. Carl Hanser Verlag, Munich 27, Germany.

The author is a jig-and-fixtures designer of long standing. Examples are given of turning, drilling, milling, grinding, and indexing devices.

20A-255. (Book) **Machining of Metal.** Robert E. Smith. 224 pages. McKnight & McKnight, 109-111 W. Market St., Bloomington, Ill. $3.50.

Step-by-step instructions for the correct and safe operation of each machine, including tool grinders, drilling machines, lathes, shapers, milling machines, power hacksaws, metal-cutting band saws, and surface-grinding machines. Each section dealing with the various types of machines describes exactly how specific operations are performed.

20B—Ferrous

20B-67. Machining Connecting Rods for the Standard Vanguard; Methods Employed at the Canley Works of the Standard Motor Co. *Machinery* (London), v. 74, May 5, 1949, p. 579-586.

20B-68. Boring Tractor Housings. *Iron Age,* v. 163, May 26, 1949, p. 70-71.

Special boring machines for the job.

20B-69. Production of Chain Wheels; Methods Employed at the New Cardiff Works of the Renold and Coventry Chain Co., Ltd. *Machinery* (London), v. 74, May 12, 1949, p. 615-621.

Machine-shop procedures and equipment.

20B-70. The Manufacture of Crankshafts and Camshafts. *Machinery* (London), v. 74, May 19, 1949, p. 651-659.

20B-71. Flywheel Production for the Standard Vanguard; Methods Employed at the Canley Works of the Standard Motor Co. *Machinery* (London), v. 74, May 26, 1949, p. 687-694.

20B-72. Dam Drills Guided by Spider & Cam. *American Machinist,* v. 93, June 2, 1949, p. 93.

Set-up for cutting small V-grooves on the faces of conduit sections for the 96-in. outlet gates for Shasta Dam. A routing technique permitted finishing each flange in 6-8 hrs. instead of 48 hrs. by conventional methods.

20B-73. Floating Holders Simplify Roller Burnishing, Elmer Neumann. *American Machinist,* v. 93, June 2, 1949, p. 102-104.

Burnished radii were necessary to stop fatigue failures in tractor shafts.

20B-74. Machining Malleable Iron. Milton Tilley, W. M. Albrecht, L. R. Spann, and J. H. Lansing. *Iron Age,* v. 163, June 2, 1949, p. 72-76.

Machining rates and techniques. Illustrated by data for a number of typical castings on feeds, speeds, tool material, coolant, and output.

20B-75. Tracer Control Simplifies Roll Turning. *Iron Age,* v. 163, June 2, 1949, p.123.

20B-76. Turning Steel-Mill Rolls at High Speed. *Machinery,* v. 55, June 1949, p. 202-203.

Turning of chilled cast-iron and steel rolls for steel mills at speeds as high as 110 surface ft. per min. has been made possible through development of a specially designed tracer-controlled engine lathe.

20B-77. Chip Removal. *Machine Design,* v. 21, June 1949, p. 106.

Device using air suction. Compressed-air supply passes through a jet into a venturi, creating suction. Designed for use on a Gifford drill spindle, this device is useful only for drilling into flat-finished cast-iron surfaces to a maximum hole depth of 1 in.

20B-78. New Engine Lathe Slashes Machining Time on Steel Mill Rolls. *Machine and Tool Blue Book,* v. 45, June 1949, p. 107-112.

20B-79. Machining Scale Knife Edges and Bearings. O. S. Carliss. *Iron Age,* v. 163, June 9, 1949, p. 50-54.

Methods used for grinding and testing these toolsteel parts, as well as milling operations in cutting the dovetail seats into which the edges fit.

20B-80. A Fixture for Continuous Milling. *Iron Age,* v. 163, June 9, 1949, p. 55.

Designed for machining a cast-iron machine part known as a traverse frame dog segment.

20B-81. Precision Machined Hydraulic Parts. Palmer Nicholls. *Western Machinery and Steel World,* v. 40, May 1949, p. 94-95.

20B-82. Milling High-Strength Alloys at Elevated Temperatures. A. O. Schmidt. *Engineers' Digest,* v. 10, May 1949, p. 169-171.

Previously abstracted from *Iron Age,* item 20B-47, 1949.

20B-83. Investigation of Optimum Geometric Form of Cutting Edges Used in Milling Machines for Rapid Machining of Stainless Steels Zh1 and Zh2. (In Russian.) G. Z. Matshin and P. N. Pobegalov. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Jan. 1949, p. 18-20.

On the basis of experimental investigation, optimum cutting-tool geometry and hard-alloy tip are recommended for the above as well as optimum operating speeds.

For additional annotations indexed in other sections, see:

19A-151

21A-34. Screws, Rivets and Studs for the '49 Ford. Albert Wright. *Western Machinery and Steel World,* v. 40, May 1949, p. 92-93.

21A-35. Manufacture in German Factories of Steel Strip Bonded With Aluminum. *Metallurgia,* v. 40, May 1949, p. 66.

Procedure consisting of rolling and application of heat.

21B—Ferrous

21B-27. San Diego Firm Proves Versatile: From Ships to Shapes to Tractors. James Joseph. *Western Metals,* v. 7, May 1949, p. 22-23.

Equipment and procedures.

21B-28. All-Steel Fabricated Railway Coaches. *Engineer,* v. 187, May 6, 1949, p. 506-507.

Design and production of 60-ft. coach.

21B-29. Economies Produced by Welding Scrapped Locomotive Axles for Large Press Dies. *Iron Age,* v. 163, June 2, 1949, p. 125.

21B-30. Efficiency Is up in Cherry-Burrell's New Cedar Rapids Plant. *Production Engineering & Management,* v. 23, June 1949, p. 59-66.

Procedures and equipment for production of dairy equipment. Operations include machining, press operations, welding, plating, and finishing. 85% of the metal used is stainless steel.

21B-31. Weaving Stainless Steel Screening. *Iron Age,* v. 163, June 9, 1949, p. 68.

Production methods.

21B-32. Coil Springs From U. S. John Rauen, Jr. *Western Machinery and Steel World,* v. 40, May 1949, p. 84-85.

Fabrication of automotive suspension coil springs by the United States Spring & Bumper Co.

21B-33. The Heart of the Power Plant. Howard C. Forster. *Western Machinery and Steel World,* v. 40, May 1949, p. 88-89.

Fabrication of gears.

21B-34. A Million Parts Per Day. C. W. Hyden. *Western Machinery and Steel World,* v. 40, May, 1949, p. 100-101.

Fabrication development of Pacific Bolt Corp.

21B-35. Steering Linkage. *Western Machinery and Steel World,* v. 40, May 1949, p. 102.

Fabrication and assembly.

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22A—General

22A-119. Treatment of Component Substances in Production of Heavily Coated Electrodes for Arc Welding. (In Russian.) N. Kryukovskii. *Avtogennoe Delo* (Welding), Dec. 1948, p. 6-8.

Materials used for coatings and ferrous alloys for the cores. Optimum conditions of such treatment for individual types of electrodes.

22A-120. Deformation and Stresses Resulting From Discontinuous Welding. (In Russian.) N. O. Okerblom and I. P. Baikova. *Avtogennoe Delo* (Welding), Dec. 1948, p. 16-20.

Investigated from the theoretical point of view, in particular, the character of the zone of thermal influence and deformations and stresses during welding of short seams. Influence of various factors.

22A-121. Radiator Production Mechanized at Ford Motor "River Rouge" Plant. Part II. (Concluded.) *Industrial Heating,* v. 16, May 1949, p. 853-860, 862-863, 865-866.

Final assembly, the solder room, cleaning, testing, painting, paint and water drying oven, and control and safety devices.

22A-122. The Powder Cutting Process for Metals. *Machinery Lloyd* (Overseas Edition), v. 21, May 7, 1949, p. 90-91, 93.

Equipment, procedures, and applications.

22A-123. Soldering as a Production Process Gains Broader Recognition. John A. Evans. *Production Engineering & Management,* v. 23, June 1949, p. 67-70.

Various solder compositions, fluxes, methods, factors in their selection, and applications.

22A-124. Production Processes—Their Influence on Design. Part XLIV. Welding, Design Factors. Roger W. Bolz. *Machine Design,* v. 21, June 1949, p. 135-143.

Extensive treatment of above subject. 44 typical welded-joint combinations are shown schematically and given concise efficiency ratings.

22A-125. What's Wrong With Welding Codes? Part I. L. K. Stringham. *Industry and Welding,* v. 22, June 1949, p. 32-34, 38.

Opinions and recommendations.

22A-126. What Welding Means to

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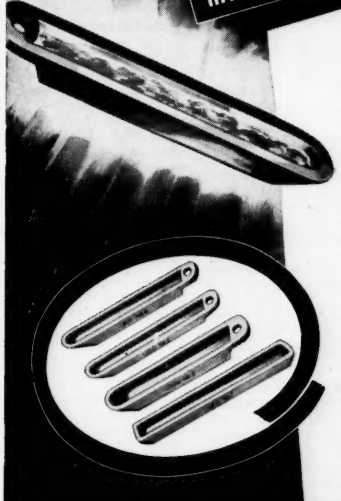

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America. Part Five. Miscellaneous Metals Industries. T. B. Jefferson. *Welding Engineer*, v. 34, June 1949, p. 33-35.

Presentation of results of a survey. Various classes of scientific instruments and other material not previously discussed.

22A-127. Supervision and Inspection of Welding. F. C. Cocks. *Transactions of the Institute of Welding*, v. 12, Apr. 1949, p. 31-36, 45.

Welding defects, incorrect joint preparation, structural discontinuities, imperfect fusion, undercutting, and other relevant aspects.

22A-128. Ways of Improving Metal-Cutting Tools. (In Russian.) A. E. Prokopovich. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Jan. 1949, p. 12-15.

Improvement of metal-cutting machines during the year 1948. Recommends, as a way of further improvement, the development of more progressive types of cutting machines, more improved systems of automatic control, and more comprehensive theoretical investigation of the bases of machining, in general.

22A-129. Arc Voltage as Related to Type of Electrode. (In Russian.) A. A. Erokhin. *Avtogennoe Delo* (Welding), Feb. 1949, p. 13-17.

Proposes use of arc voltage at normal arc length for a given electrode and other standard conditions as differentiation characteristics for welding electrodes. Such voltage is called the nominal voltage and depends on electrode composition and coating. A formula determining the specific power consumption per unit weight of melted metal is derived.

22A-130. (Book) **Standard Welding Terms and Their Definitions.** American Welding Society, 33 W. 39th St., New York 18, N. Y. $1.00.

Contains more than 500 terms and defines basic welding concepts.

22A-131. (Book) **Fundamentals of Soft Soldering.** Charles Yerkow. 96 pages. 1949. The Manual Arts Press, Peoria, Ill.

Basic principles and steps. Topics covered include soldering with an iron and with flame burner, soldering various metals, mass-production suggestions, and a job breakdown.

22A-132. (Book) **Pour le soudeur au chalumeau et le découperur.** (For the Gas Welder and Catter.) L. Mendel. 274 pages. 1948. Dunod, 92 rue Bonaparte, Paris 6, France.

A practical instruction manual. Theoretical, chemical, and physical considerations are omitted.

22A-133. (Book) **Pour le soudure a l'arc.** (Manual for Arc Welders.) L. Mendel. 158 pages. 1948. Dunod, 92 rue Bonaparte, Paris 6, France.

A practical instruction manual. Four different methods; information on design, preparation for welding, optimum conditions, use of different types of electrodes.

22A-134. (Book) **Svetsteknisk Handbok.** (Handbook of Welding Engineering.) Vol. I and II. H. Swedenborg, O. Forsman, and E. Pelow, editors. 699 and 625 pages. Natur & Kultur, Stockholm, Sweden. 22 Swedish Kr.

Vol. I deals with descriptions of the various processes, welding metallurgy, and the application of welding to various metals. Processes such as brazing and gas cutting. The second volume is concerned with fabrication and design of pressure vessels, shipbuilding, aircraft, railways, machinery, and general structures. Methods of weld testing and joint design for various types of welded structures.

22A-135. (Book) **Praktisches Handbuch der Lichtbogenschweissung.** (Practical Handbook of Electric Arc Welding.) Kth. Dag Du Rietz and Helmut Koch. 300 pages. 1947. Friedr. Vieweg & Sohn, Braunschweig, Germany.

Details of equipment and methods. Methods of testing the strength of welded joints. 384 ref.

22B—Ferrous

22B-184. Electrodes for Welding-on of Cutting Edges. (In Russian.) V. A. Lapidus. *Avtogennoe Delo* (Welding), Dec. 1948, p. 13-16.

Properties of two new electrodes which permit production of built-up tools whose stabilities are not surpassed by tools of forged, rapid-cutting steel of the same designation. Electrodes are fully recommended for industrial application.

22B-185. Variation of Stresses During Welding. (In Russian.) I. P. Trochun. *Avtogennoe Delo* (Welding), Dec. 1948, p. 22-23.

Stress variations in structural members as a result of heating and cooling during welding. Formation of residual stresses.

22B-186. Oxygen-Flux Cutting of High-Chromium Steel. (In Russian.) S. G. Guzov. *Avtogennoe Delo* (Welding), Dec. 1948, p. 24-25.

Process and optimum conditions for different sizes of material.

22B-187. Character of Primary Crystallization of the Welding Bath. (In Russian.) A. M. Makara and B. I. Medovar. *Avtogennoe Delo* (Welding), Dec. 1948, p. 25-27.

Investigated particularly for steel billets and castings. It was concluded that the curve of crystallization in such cases has a jagged character due to the liberation of heat during formation of a nucleus of crystallization. Such crystallization may be represented by a wave function.

22B-188. A Survey of the Weldability of Plain-Carbon and Low-Alloy High-Tensile Steels. H. C. Skevington. *Sheet Metal Industries*, v. 26, May 1949, p. 1039-1048.

Definitions of weldability and factors influencing weldability, metallurgical changes at welded joints, influence of heating and cooling on weld structure, effects of plate thickness, effect of multi-pass welding on varying thicknesses of plate, influence of base-metal composition on weldability, cracking in the heat-affected zone, weld-metal cracks, influence of sulfur on weldability, and weldability tests. 28 ref.

22B-189. A Welded Construction Drilling Jig. Robert Mawson. *Iron Age*, v. 163, May 19, 1949, p. 94-95.

Application to quick-change gear box, made of cast iron and used on a special type of machine.

22B-190. Resistance-Weld Failures Minimized by Test Method Applied to Diversified Joining Operations. *Steel*, v. 124, May 23, 1949, p. 90-93, 111, 113.

Details of quality-control system. Chart of standardized welding procedures is posted on each machine. A circular slide-rule-type device is used to convert angle of twist, torque, thickness, and weld-diameter data into shear strength and a "quality-control number". The application to several types of steel.

22B-191. Selecting Steel Arc-Welding Electrodes. *Machine Design*, v. 21, June 1949, p. 151-152.

Based on AWS-ASTM tentative joint specifications.

22B-192. A Survey of the Use of Welding in Structures. W. S. Atkins. *Welding*, v. 17, May 1949, p. 212-221.

22B-193. Welding on British Railways; Trackwork and Structures. N. W. Swinnerton. *Welding*, v. 17, May 1949, p. 222-228. A condensation.

22B-194. Welding Fixtures Speed Steel Cabinet Assembly. Walter Rudolph. *American Machinist*, v. 93, June 2, 1949, p. 96-97.

Teamwork and quick-acting fixtures combine with gas and gun welding to boost output.

22B-195. Flame Beveler Positioning. *Iron Age*, v. 163, June 9, 1949, p. 65.

Improved method which permits positioning of the beveling-machine frame rather than the tank for flame beveling tank plate preparatory to welding.

22B-196. Brazing in Salt Bath Furnaces. *Iron Age*, v. 163, June 9, 1949, p. 66-68.

Previously abstracted from *Metallurgia*, item 22A-90, 1949.

22B-197. Arc Welding a Housing Case for Hydraulic Drive. George Pheil. *Machine and Tool Blue Book*, v. 45, June 1949, p. 130-132.

22B-198. Arc Welded Design Used Advantageously on Farm Implements. *Steel*, v. 124, June 13, 1949, p. 101.

22B-199. Manual Submerged Arc Process Simplifies Welding for Many Uses. C. G. Herbruck. *Materials & Methods*, v. 29, June 1949, p. 64-66.

Hand method of submerged-arc welding as applied to irregular and otherwise inaccessible locations.

22B-200. Here's How Caterpillar Does It: Manufacturing Development. C. A. Matheny and W. J. Myers, *Industry and Welding*, v. 22, June 1949, p. 26-29, 64.

Organization and activities of Caterpillar Tractor Co.'s manufacturing development division. Some new welding designs developed.

22B-201. Are Your Shape Cutting Practices up to Date? F. B. Rykoskey. *Industry and Welding*, v. 22, June, 1949, p. 40-42, 44, 46, 65.

Equipment and procedures used by B. & O. R.R. shops. Of especial interest are the stack and flux-injection cutting operations.

22B-202. Scarfing in the Steel Mill. George Mersot. *Welding Engineer*, v. 34, June 1949, p. 20-22.

Procedure for flame-deseaming of blooms, billets, and slabs, commonly known as scarfing.

22B-203. Flash Welding African Rails. J. M. Lawless. *Welding Engineer*, v. 34, June 1949, p. 23.

Joining of three 40-ft. lengths into one 120-ft. rail at central depots.

22B-204. British Welded Railway Cars. Fred Brewster. *Welding Engineer*, v. 34, June 1949, p. 29.

London, Midland and Scottish Railway is using American production methods at its Derby plant. Large rotary jig rotates entire car to allow downhand welding.

22B-205. Bridge Flame-Straightened. Harriet Geithmann, *Welding Engineer*, v. 34, June 1949, p. 36-37.

Restoration of flood-battered bridge by flame-straightening and the welding torch.

22B-206. Pipe Production Line. *Welding Engineer*, v. 34, June 1949, p. 38-40.

Line at Maywood, Calif., said to be the first in the world to produce 30-in. diam. high-strength welded pipe on a commercial scale.

22B-207. Building-up a 2,000 Ton Breakdown. Richard Thuma. *Tool & Die Journal*, v. 15, June 1949, p. 46-47.

Fabrication of a platen for a 2000-ton hydraulic press from steel plate by forging and welding at Allis-Chalmers.

22B-208. New Factors to Be Considered in the Design and Welding of Ships. Milton Forman. *Journal of the American Society of Naval Engineers*, v. 61, May 1949, p. 494-505. Reprinted from

Welding Journal, v. 27, Sept. 1948, p. 671-678.

Previously abstracted from original, item 22b-279, 1948.

22B-209. Economies of Castings and Weldings. E. C. Moore. *Transactions of the Institute of Welding*, v. 12, Apr. 1949, p. 27-29.

Comparative labor and material costs of the two methods. Concludes that, for machine frames of 10-35 tons weight, welding is much more economical.

22B-210. Repairs to the All-Welded Tanker "Afghanistan". A. L. White. *Transactions of the Institute of Welding*, v. 12, Apr. 1949, p. 37-45.

Methods used.

22B-211. Welding in Shipbuilding, With Particular Reference to Passenger Liner Construction. L. Redshaw. *Welding Research*, v. 3 (bound with *Transactions of the Institute of Welding*, v. 12), Apr. 1949, p. 36r-46r.

Extensive information concerning specific details. Cost distribution, types of electrodes, percentage savings at five different stages in the progressive change-over from riveted to welded ships.

22B-212. Welding as a Means of Economising on Material and Labour in the Manufacture of Machinery Structures. F. Koenigsberger. *Welding Research*, v. 3 (bound with *Transactions of the Institute of Welding*, v. 12), Apr. 1949, p. 26r-35r.

Extended discussion.

22B-213. Uber eine Verbundschweissung. (Concerning a Compound Weld.) Fr. Bischof. *Schweissen und Schneiden*, v. 1, Feb. 1949, p. 26-28.

Methods and problems of welding steels with alkali-coated ferritic and austenitic electrodes and the danger of cracking at the transition zones and solid-solution boundaries by age-hardening caused by the formation of martensite. Welded samples were tested for hardness and metallographically examined.

22B-214. Einfluss der Oberflächenrauhigkeit und Passung beim Hartlöten. (The Effect of Surface Roughness and Fit in Hard Soldering.) Lothar Leinert. *Metalloberfläche*, v. 3, Mar. 1949, p. 62-67.

Results of experiments showing effects of above on joint strengths for various machine parts designed to be joined by hard soldering. 29 ref.

22B-215. Multiple Pass Automatic Welding of Thick Boiler Steels. (In Russian.) K. V. Lyubavskii and B. I. Lazarev. *Avtogennoe Delo* (Welding), Feb. 1949, p. 1-7.

Investigated for three different low-alloy steels (max. 0.15% C, 0.78% Si, 0.40% Mn, 0.029% S, 0.021% P, 0.50% Mo) using three different types of coated electrodes. Optimum conditions of operation and influence of individual factors, such as the form of the seam, compositions of electrode cores and coatings.

22B-216. Argon-Arc Welding of Thin Stainless Sheet Steel Without Use of Additional Metal. (In Russian.) A. G. Mazel. *Avtogennoe Delo* (Welding), Feb. 1949, p. 8-13.

Optimum conditions for butt welding 1.5-mm.-thick sheets of stainless steel without welding rods. Metallographic and X-ray investigations showed that the strength of a welded joint, on the average, is not less than that of the base material.

22B-217. (Book) **Welding Metallurgy: Iron and Steel.** Ed. 2. G. E. Linnert. 505 pages. 1949. American Welding Society, 33 W. 39th St., New York 18, N. Y.

This book is a revision of the one written by O. H. Henry and G. E. Claussen in 1940. Processes introduced during the past eight years such as inert-gas metal-arc welding, and more information on the metallurgy of specific materials such as the stainless, heat resisting, and stainless-clad steels. The fundamentals of metallurgy are discussed in the first chapters.

22C—Nonferrous

22C-14. "Glo-Coat" Welded Twins. Clyde B. Clason. *Welding Engineer*, v. 34, June 1949, p. 30-32.

Unusual application of spot welding to the packaging field. Two cans are joined into one package.

22C-15. Soudure électrique en bout du cuivre et de l'aluminium pour la substitution, efficace de l'un a l'autre dans les conducteurs électriques. (Electric Buttwelding of Copper and Aluminum for the Efficient Substitution of One for the Other in Electrical Conductors.) Gabriel Duch. *Comptes Rendus* v. 228, Mar. 7, 1949, p. 844-846.

New method.

22C-16. Application of Electric Contact Soldering Using a Copper Phosphide Solder. (In Russian.) Z. M. Ryzhik. *Avtogennoe Delo* (Welding), Feb. 1949, p. 24-25.

For different types of joint. Application to electrical-contact joining is said to be a highly efficient process.

22C-17. Technology of Welding Zinc-Alloy Machine Parts. (In Russian.) P. A. Radkevich. *Avtogennoe Delo* (Welding), Feb. 1949, p. 31.

Method, with special reference to repair of broken parts.

22D—Light Metals

22D-37. Decrease of Deformation During Welding by Peening the Seams. (In Russian.) V. M. Rybakov. *Avtogennoe Delo* (Welding), Dec. 1948, p. 20-21.

Tabulated and charted data of experimental investigation indicates that peening considerably decreases the deformation caused by welding. The extent of such decrease was found to depend on the width of the zone of shrinkage and on yield points of the fused-on and the base metal.

22D-38. Furnace Brazing Aluminum Refrigerator Parts. J. N. Woolrich. *Iron Age*, v. 163, May 26, 1949, p. 62-65.

Techniques used in the volume production of liners, evaporators, and shelves for home freezers and refrigerators. Why aluminum-brazed assemblies were selected in preference to other possibilities; and various methods of applying the brazing alloy and the importance of controlling furnace temperature.

22D-39. (Book) **Riveting Alcoa Aluminum.** 61 pages. 1948. Aluminum Company of America, Pittsburgh, Pa.

Materials, driving methods, protection of joints.

For additional annotations indexed in other sections, see:

3B-120; 16A-53; 19B-108; 20A-240

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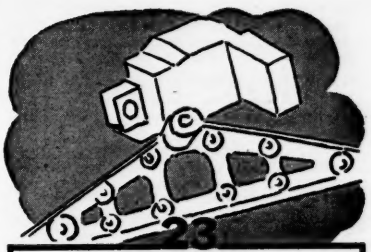


23 APPLICATIONS

23A—General

23A-13. Ceramal: New Turbine Blade Alloy. *Aviation Week*, v. 50, May 23, 1949, p. 26-27.

Early research. Properties and use of ceramal, a combination of ceramics and metals, as a heat resistant material.

23A-14. Nonslip Materials Find Wide Use in Industry. T. C. Du Mond. *Materials & Methods*, v. 29, June 1949, p. 59-61.

Properties and applications of a wide range of special low-friction materials, both metallic and nonmetallic, for use as walkway surfaces.

23A-15. Materials at Work. *Materials & Methods*, v. 29, June 1949, p. 62-63.

Welded shovel dipper; molded-glass machine parts; transparent acrylic antenna domes; ethyl cellulose roller printer; alloy-steel cylinders; and Al-alloy hoist.

23A-16. Betrachtungen uber den Wärmeverbrauch von Kochgeschirren. (Observations on the Heat Consumption of 'Cooking Utensils.) Hans J. Karmaus. *Metalloberfläche*, ser. A, v. 3, May 1949, p. 111-114.

A study of the thermal efficiency of cooking utensils made of different materials and with different internal and external surface treatments.

23B—Ferrous

23B-23. Notes on the Uses of Stainless Steels in the Petroleum Industry. Paul L. Weinman. *American Society of Mechanical Engineers*, Preprint, 1948, 13 pages.

23B-24. Materials Used in Steam Turbine Rotor Forgings. C. Sykes. *Journal of the West of Scotland Iron and Steel Institute*, v. 55, 1947-48, p. 11-23; discussion, p. 23-45.

Types of steel used in rotor forgings, their properties, and methods of manufacture and inspection.

23B-25. Less Truck Weight With High-Strength Steel. *Automotive Industries*, v. 100, June 1, 1949, p. 39, 60.

Economical use of high-strength steel to reduce weight, improve rust-resistance, and withstand abrasive wear in light truck bodies.

23B-26. New Alloy Steel Increases Service Life of Plastics and Die-Cast Mold Bases. *Vancoram Review*, v. 6, no. 1, [1948], p. 10.

23B-27. Talgo Train Makes Extensive Use of Alloy Steel Castings. *Iron Age*, v. 163, June 9, 1949, p. 58-59.

Castings used.

23C—Nonferrous

23C-37. The Use of Silver in the Construction of Chemical Plant. J. M. Pirie. *Journal of the Imperial College Chemical Engineering Society*, v. 2, 1946, p. 27-36.

Economic aspects, chemical and physical properties, methods of use,

solid-silver plant, sheet-silver linings, deposited linings and clad linings, and corrosion resistance. 12 ref.

23C-38. Rock Drilling Experience With Tungsten Carbide Bits. Blair Burwell. *Mining Congress Journal,* v. 35, May 1949, p. 24-27.

Long European experience, importance of alignment, blasting economies, bit connection problems, and service records.

23C-39. Use of Aluminum and Zinc Based Alloys for Electric Conduit Installations. *Engineer,* v. 187, May 6, 1949, p. 511.

Factors, which limited experience and known general properties of light alloys have indicated to be of particular importance.

23C-40. A Carbide Die—Its Cost and Performance. Herbert Harig. *Tool & Die Journal,* v. 15, June 1949, p. 51-52.

Use of tungsten carbide; figures as to cost, maintenance, and performance.

23D—Light Metals

23D-41. A New Construction Material: Aluminum Siding Mill-Primed With Zinc Chromate Paint. *Paint Progress,* v. 7, No. 4, [1949], p. 2-3.

With methods of applying primer.

23D-42. Some British Achievements in Aluminium. E. G. West. *Metal Industry,* v. 74, Apr. 29, 1949, p. 323-326.

23D-43. Magnesium Alloys; British Developments and Applications. John Sully. *Metal Industry,* v. 74, Apr. 29, 1949, p. 327-329; May 6, 1949, p. 367-368.

23D-44. The Economics of Aluminium-Alloy Superstructures. W. Stanley Hinde. *Engineering,* v. 167, Apr. 29, 1949, p. 391. A condensation.

As applied to ship construction.

23D-45. The Electronics Industry Turns to Magnesium. Ralph G. Gillespie. *Magazine of Magnesium,* May 1949, p. 8-11.

Properties and various applications in electronics.

23D-46. Architect's Viewpoint. Richard Betham. *Light Metals,* v. 12, May 1949, p. 278-283.

Reviews a lecture given by W. C. Devereux on the structural use of light alloys. Choice of material and durability.

23D-47. Magnesium in the Mamba, Double Mamba and Python. *Light Metals,* v. 12, May 1949, p. 290-295.

The production and use of Mg in Armstrong Siddely gas-turbine propeller engines.

23D-48. Lagonda Printing Press. *Light Metals,* v. 12, May 1949, p. 296.

Use of Al to minimize inertia in critical moving parts.

23D-49. The Electronics Industry; Big Field for Magnesium. R. G. Gillespie. *Modern Metals,* v. 5, May 1949, p. 28-30.

Present and potential applications.

23D-50. Magnesium and Aluminum Construction Reduce Trailer Weight Over Half Ton. *Automotive Industries,* v. 100, May 15, 1949, p. 29, 86.

23D-51. The Use of Anodized Aluminum in the Construction of Calorimeter Heaters. George W. Murphy. *Review of Scientific Instruments,* v. 20, May 1949, p. 372-373.

A technique for preparing insulated heaters with very low heat lag and heat capacity and high durability.

23D-52. Engineering Applications of Oxide-Coated Aluminium. V. F. Henley. *Machinery* (London), v. 74, May 19, 1949, p. 664-667.

23D-53. Magnesium for Jets. Nathaniel F. Silsbee. *Aero Digest,* v. 58, June 1949, p. 46-47.

Applications in various jet planes.

23D-54. Aluminum: New Alcoa Administration Building at the Davenport Plant is a Gleaming Package of the Many Mature Uses of This Metal in Building. *Architectural Forum,* v. 90, June 1949, p. 76-79.

23D-55. Alcoa Builds a Rolling Mill for Aluminum of Aluminum. *Engineering News-Record,* v. 142, June 9, 1949, p. 66-68.

Office building and rolling mill at Davenport, Iowa, having aluminum wall and roof panels.

23D-56. Aluminum Foil Fire-Fighting Suit Proves Superior in AMC Tests. *Technical Data Digest,* v. 14, June 1, 1949, p. 8-9.

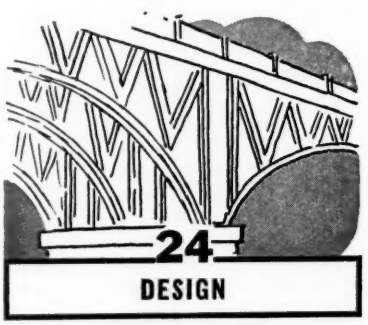
Six types of suits.

23D-57. Impiego della carta di alluminio negli imballaggi. (Aluminum Foil Packaging.) A. Perrone. *Alluminio,* v. 18, Jan.-Feb. 1949, p. 21-46.

Properties of aluminum foil by itself as well as bonded to cellulose paper, plastic films, and varnishes, especially as regards permeability to moisture. Systems commonly used for packaging with these foils are considered. Tables show results obtained by tests on food and drugs, cigarettes and candy, with various wrappings.

For additional annotations indexed in other sections, see:

3B-124



24A—General

24A-81. Designing for Gas-Turbine Materials. M. H. Young. *Aeronautical Engineering Review,* v. 8, May 1949, p. 39-40. A condensation.

Previously abstracted from *Aviation Week,* item 24A-53, 1948.

24A-82. Some Aspects of Propeller Fatigue Testing. G. C. I. Gardiner. *Aircraft Engineering,* v. 21, May 1949, p. 149-152.

Practical application of results of fatigue testing to design of components.

24A-83. Application of Fatigue Data to Machine Design. R. E. Peterson. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 60-78.

Size-effect problem.

24A-84. Analysis of Stress in Aircraft Engines. William T. Bean, Jr. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 100-123.

Design, material, and load analysis. 13 ref.

24A-85. Design for Energy Absorption. Wendell P. Roop. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 140-170.

Quality-control design for ductility, load, cushioning and overload, monotonic loading, limits of plastic response, ductility measured by energy absorption, energy absorption and geometry, and design for energy absorption. 13 ref.

24A-86. The Influence of Manufacturing Accuracy on Additional Stresses. F. Salzmann. *Escher Wyss News,* v. 19-20, 1946-47, p. 86-89.

In machine components subjected to tensile or compressive loads, slight deviations from the correct geometrical form can be the cause of considerable additional bending stresses. Analyzes slightly bent bar subjected to tensile load; tube of noncircular cross-section stressed by internal pressure, and cylindrical tube subjected to axial tension, with slight deviation of the meridian from a straight line.

24A-87. Werkstoff- und Gestaltungsprobleme bei Dampf- und Gasturbinen. (Material and Design Problems of Steam and Gas Turbines.) H. Niermeyer. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 145-154.

An illustrated review. 72 ref.

24A-88. Designing for Lower Costs. *Product Engineering,* v. 20, June 1949, p. 81-168.

Introductory article, "Designing for Quality at Lower Costs", by O. A. Wheelon, and a series of graphs showing unit costs for Al and Mg-alloy castings, Mg-alloy and steel forgings and forging dies. Then specific cases, materials and construction; assembly methods; machine elements; electrical equipment; hydraulics and pneumatics; finishes; and standardization. Under "Materials and Constructions," design and applications are emphasized. "Assembly Methods" cites several applications of fasteners, welding, and brazing. "Finishes" describes several metal-finishing processes and applications.

24A-89. Belleville Spring Design Charts. IV. Leslie W. Jones. *Product Engineering,* v. 20, June 1949, p. 181, 183.

Nomographic charts for 60 and 75% pressure drops.

24A-90. Helpful Hints for the Engineer on Jig and Fixture Design. P. H. Winter. *Production Engineering & Management,* v. 23, June 1949, p. 56-58.

Use of simplified formulas enables design engineers to eliminate unnecessary weight on jigs and fixtures and still obtain dependable results.

24A-91. Interchangeable Tolerances—Arbitrary or Natural? Dorian Shainin. *Machine Design,* v. 21, June 1949, p. 130-134.

Previously abstracted from *SAE Journal,* item 24A-36, 1949.

24A-92. The Treatment and Properties of Springs. B. Coates. *Journal of the Birmingham Metallurgical Society,* v. 29, Mar. 1949, p. 21-39; discussion, p. 40-49.

Types of springs; materials used; physical properties; heat treatment; surface finish; and special coatings and finishes.

24A-93. Elastic Buckling of a Simply Supported Plate Under a Compressive Stress That Varies Linearly in the Direction of Loading. Charles Libove, Saul Ferdman, and John J. Reusch. *National Advisory Committee for Aeronautics,* Technical Note 1891, June 1949, 33 pages.

Results of calculations for plate of uniform thickness subjected to unequal compressive stresses at two opposite edges with a linear variation of stress between.

24A-94. (Book) **Mathematical Theory of Elasticity.** Ed. 4, rev. A. E. H. Love. 643 pages. Dover Publications, 1780 Broadway, New York 19, N. Y. $5.95.

Practical applications and a thorough, rigorous discussion of fundamental concepts. Analysis of strain

and stress, elasticity of solid bodies, equilibrium of isotropic elastic solids, elasticity of crystals, vibration of spheres and cylinders, propagation of waves in elastic solid media, torsion, theory of continuous beams, and theory of plates.

24A-95. (Book) **Strength of Materials.** C. O. Harris. 212 pages. American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill. $4.90.

Strength of materials, prepared both for engineering students and for industry personnel. Stresses in beams, strengths of various types of joints, compression factors, fatigue in metals and other topics.

24A-96. (Book) **Elements of Strength of Materials.** Ed. 2. S. Timoshenko and Gleason H. MacCullough. 371 pages. 1948. D. Van Nostrand Co., 250 Fourth Ave., New York 3, N. Y.

Designed as a textbook for undergraduates. Determination of tensile and compressive stresses with temperature change in simple statically indeterminate structures. Double integration and area-moment methods for solving problems in deflection of beams.

24A-97. (Book) **Einfuhrung in die Festigkeitslehre fur Studierende des Bauwesens.** (Introduction to the Theory of the Strength of Materials for Students of Civil Engineering.) Ed. 3, rev. Fritz Chmelka and Ernst Melan. 304 pages. 1948. Springer-Verlag, Vienna, Austria.

24B—Ferrous

24B-30. Welding as a Means of Economizing on Material and Labour in the Production of Machinery Structures. F. Koenigsberger. *Machinery* (London), v. 74, May 5, 1949, p. 587-591. A condensation.

Possible savings.

24B-31. Factors Influencing the Economic Design of Pressure Vessels. G. E. Fratcher. *American Society of Mechanical Engineers,* Preprint, 1948, 8 pages.

For welded fabrication. Points out the importance of materials and codes. Effect of addition of corrosion allowance.

24B-32. Surface Finish, Hardness and Life of Steel Parts. Charles Lipson. *Product Engineering,* v. 20, June 1949, p. 179.

Presents nomographic chart for anticipated service life of steel parts for any given design stress, hardness, and surface finish. Two examples.

24B-33. Liberty Ship Tailshaft Failures. *Journal of the American Society of Naval Engineers,* v. 61, May 1949, p. 506-508. Reprinted from *Marine Engineer,* Sept. 1948.

Modification to eliminate the cause of failures experienced in this design as a result of torsional vibration.

24C—Nonferrous

24C-7. Product Design With Die Castings: A Steak Machine. *Die Castings,* v. 7, June 1949, p. 34-36, 63.

Design and finish of machine for making steaks and other cuts of meat tender. Use of die castings.

24C-8. Made to Measure. *Die Castings,* v. 7, June 1949, p. 20-22, 59.

Zn-alloy, die-cast frame and parts of positive-displacement-type meter.

24C-9. Improved High-Speed Roller Bearings. Donald F. Wilcock and Frederick C. Jones. *Lubrication Engineering,* v. 5, June 1949, p. 129-133.

Examination of bearings removed from turbine engines revealed that the principal source of difficulty was in the brass roller separator or retainer. Laboratory test stand developed for study of full-size bearings under operating conditions. Results of test program. Effect of lubricant composition; effect of oxide coating of steel parts on transfer of brass to these parts; effects of other metals and electroplates on separator operation and life (silver plating found best); and effects of design modifications.

24D—Light Metals

24D-7. Column Curves for Magnesium-Alloy Sheet. Evan H. Schuette. *Journal of the Aeronautical Sciences,* v. 16, May 1949, p. 301-305, 310.

Results for flat-end tests of 129 columns cut from flat FS-1h, FS-1a, and Ma magnesium-alloy sheet 0.250 in. thick and for clamped-end tests of 26 columns cut from flat FS-1h sheet 0.064 in. thick. The best empirical fits to the data were obtained with a parabolic formula.

24D-8. A Well-Integrated Product Design. *Die Castings,* v. 7, June 1949, p. 27-28, 65.

Paint spray-gun compressor, which incorporates four Al die-cast housing parts.

24D-9. Compression Tests of Curved Panels With Circular Hole Reinforced With Circular Doubler Plates. Wilhelmina D. Kroll and A. E. McPherson. *Journal of the Aeronautical Sciences,* v. 16, June 1949, p. 354-364.

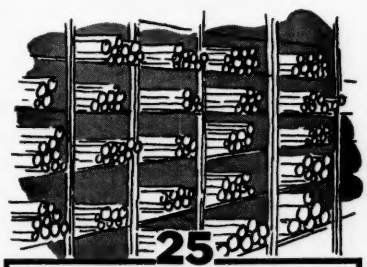
Fourteen specimens of 24S-T Al-alloy sheet were tested to determine the effect of sheet curvature on strain distribution around circular holes. Specimens with and without reinforcement of the hole were included. Radius of curvature ranged from 10 in. to infinity.

24D-10. Compressive Buckling of Flat Rectangular Metalite Type Sandwich Plates With Simply Supported Loaded Edges and Clamped Unloaded Edges. Paul Seide. *National Advisory Committee for Aeronautics,* Technical Note 1886, May 1949, 19 pages.

Theoretical solution. Comparison of computed and experimental buckling stresses of sandwich plates with Al-alloy faces and balsa-wood and cellular-cellulose-acetate cores indicates reasonable agreement between theoretical and experimental results.

For additional annotations indexed in other sections, see:

19A-143; 22A-124



25 MISCELLANEOUS

25A—General

25A-91. Economic Mobilization and the Mineral Industry. John D. Morgan, Jr. *Mining Congress Journal,* v. 35, May 1949, p. 31-33, 43.

Incongruous regionalization plans which hampered production of essential materials in World War II. Suggests a plan with what is thought to be adequate decentralization.

25A-92. The Electrochemical and Electrometallurgical Industry of Norway. C. W. Eger. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 13-15.

The principal electrochemical and electrometallurgical plants, and their products, in the various industrial areas of Norway.

25A-93. Scientific Research at Mellon Institute, 1948-49. *Chemical and Engineering News,* v. 27, May 30, 1949, p. 1591-1595.

Progress of chemical interest on 45 multiple and 33 individual fellowships, including work on several metallurgical problems.

25A-94. The New Materials Testing Department of Escher Wyss. W. Stauffer. *Escher Wyss News,* v. 19-20, 1946-47, p. 3-16.

Well-equipped mechanical and chemical testing laboratory of a Swiss firm.

25A-95. Nuclear Instrument Handbook. *Nucleonics,* v. 4, May 1949, p. 97-152.

Consists of "Survey of Nucleonics Instrumentation Industry", R. E. Lapp; five papers on measurement problems ("Nuclear Physics", Sanborn C. Brown; "Radiology", Howard L. Andrews; "Health Physics", David Balber; "Radiochemistry", L. Yaffe; and "Industry"—a list of suggested uses of isotopes); two papers on properties of materials ("Photographic Recording Media", Herman Yagoda; and "Counter Fillings", Sanborn C. Brown); "Bibliography on Radiation Detection", H. H. Goldsmith; and buyers' guide.

25A-96. Mineral Depletion and Metal Supply. Evan Just. *Journal of Chemical Education,* v. 26, June 1949, p. 331-333.

25A-97. What Is Metallurgy? John Chipman. *Journal of Metals,* v. 1, sec. 3, June 1949 (*Metal Transactions,* v. 185), p. 349-354.

Metallurgical engineering, science, and education. Includes an outline of metallurgy.

25A-98. The Surface Roughness of Bearing Surfaces and Its Relation to Oil Film Thickness at Breakdown. A. Cameron. *Engineer,* v. 187, May 13, 1949, p. 540-541. A condensation.

Special test method and apparatus. Experimental results.

25A-99. Basic Research Projects Under ONR Contracts. Karl R. Sapngenberg and Walter E. Greene. *Electronics,* v. 22, June 1949, p. 66-69.

Extent to which Office of Naval Research is sponsoring fundamental research. Details of several current projects that promise early practical applications.

25A-100. The Production of Stable Isotopes and Their Uses in Research. W. C. Davis, L. O. Love, and L. O. Gilpatrick. *U. S. Atomic Energy Commission,* AECD-2436, Nov. 18, 1948, 6 pages.

Progress on a project using the equipment and techniques developed for the electromagnetic concentration of U^{235} for the separation of the isotopes of the entire periodic table of the elements. Isotopes of Fe and Hg are discussed.

25A-101. Radioéléments artificiels en métallurgie. (Artificial Radioactive Elements in Metallurgy.) Pierre Sue. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 72-78.

Surveys uses of radioactive isotopes (artificially produced) as tracers in metallurgical research. 33 ref.

25A-102. Annual Report of the Defence Research Laboratories for the Year Ended 30th June, 1948. *Dept. of Supply and Development, Commonwealth of Australia,* 46 pages.

Progress reports on general chem-

istry, chemical defense, explosives and ammunition, metallurgy, engineering, metrology, and physics.

25A-103. (Book) **The Basing Point System.** Fritz Machlup. 275 pages. Blakiston Co., Philadelphia 5, Pa. $5.00.

Economic analysis reviews history of the development of the system and of court examinations of it. Arguments as to the monopolistic or discriminatory features of the system, and a theoretical evaluation of the cost of abolishing the system.

25A-104. (Book) **Metal Statistics, 1949.** Ed. 42. 800 pages. 1949. American Metal Market Co., 18 Cliff St., New York 7, N. Y.

25A-105. (Book) **Commodity Year Book, 1949.** 472 pages. 1949. Commodity Research Bureau, Inc., 82 Beaver St., New York 5, N. Y.

To assist business men in evaluating the implications of the effects of developments, both national and international, with respect to the various commodities and to their own businesses. Includes numerous special articles on topics such as hedging, farm price supports, as well as on individual commodities. Data for the first time on a number of lesser known but strategically important metals.

25A-106. (Book) **The Domestic Mining Industry of the United States in World War II; A Critical Study of the Economic Mobilization of the Mineral Base of National Power.** John Davis Morgan Jr. 500 pages. 1949. National Security Resources Board, Washington 25, D. C.

Various problems which arise: manpower, supply, equipment, government relationships, and others. 31 page bibliography.

25A-107. (Book) **Politica Metalurgica do Brasil.** (Metallurgical Policy of Brazil.) 102 pages. Oct. 1948. University of Sao Paulo, Polytechnical School, Sao Paulo, Brazil. (Bulletin No. 6.)

Symposium and discussion divided into four parts: the fuel problem; the ore-exportation problem; production of ferrous and nonferrous metals, including reducing agents and processes; and existing installations.

25B—Ferrous

25B-28. A Report by the *Iron Age* to the Metalworking Industry: Steel Consumption in 1948. Oliver Johnson. *Iron Age,* v. 163, May 26, 1949, insert between p. 72 and 73.

Typical portion of detailed study of geographic pattern of distribution of finished steel. Data cover use of 10 classifications in 48 state areas and 68 industrial areas. The complete report, which is available gratis, on request, is illustrated by data for Ohio and the Cleveland area.

25B-29. Always More Production. S. J. Cort. *Iron and Steel Engineer,* v. 26, May 1949, p. 95-98.

Trends and future prospects of the iron and steel industry.

25B-30. (Book) **Chernaya Metallurgiya v Novoi Pyatiletke.** (Ferrous Metallurgy in the New Five-Year Plan.) I. P. Bardin and N. P. Bannyi. 176 pages. 1947. Institute of Metallurgy, Academy of Sciences of the USSR, Moscow and Leningrad.

The present position of ferrous metallurgy in the U.S.S.R. and in foreign countries. On the basis of available data on raw material reserves, the goal and the means of achievement of the new 5-year plan are indicated. Planned production of ferrous metal at the end of 1950. Contains little concrete data concerning past performance.

25C—Nonferrous

25C-36. World Sales of Nickel in 1948 Amounted to 240,098,274 Pounds; Exceeded 1947 Total. Robert C. Stanley. *Metals,* v. 19, May 1949, p. 7, 9, 12.

Presents statistics and urges removal of U. S. import duty on copper.

25C-37. Outlook for Zinc Markets Is Promising. R. G. Kenly. *Metals,* v. 19, May 1949, p. 10-12.

25C-34. Copper and Its Alloys; Report on Some Recent British Advances. E. Voce. *Metal Industry,* v. 74, Apr. 29, 1949, p. 330-332; May 6, 1949, p. 366, 368.

37 references.

25C-35. Tin, A World Anxiety. *Mining World,* v. 11, May 1949, p. 36-40.

Production of tin by countries. Unstable domestic conditions and price problems as related to available supply.

25D—Light Metals

25D-20. Magnesium and Its Characteristics. T. R. B. Watson. *Canadian Mining Journal,* v. 70, May 1949, p. 72-75.

History, mineralogy, extraction, properties, alloys, heat treatment, inflammability, corrosion, and applications.

25D-21. The Magnesium Industry in 1948. W. S. Loose. *Modern Metals,* v. 5, May 1949, p. 13-14.

25D-22. The Magnesium Casting Industry; Its Problems and Outlook. Robert T. Wood. *Modern Metals,* v. 5, May 1949, p. 21-23.

Technical and economic problems, indicating advantages and disadvantages of sand-cast and permanent-mold types for various applications.

25D-23. Aluminum. R. L. Templin. *ASTM Bulletin,* May 1949, p. 45-47.

Resources, mining and extraction, alloys, properties, fabrication, and applications.

25D-24. Beryllium Poisoning. Robert J. Hasterlik. *Physics Today,* v. 2, June 1949, p. 14-17.

The effects which can cause acute lung disease. Precautions to be taken.

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METALS REVIEW

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Directory of Translators Established by S. L. A.

A directory of translators has been established by the Science-Technology Group of the Special Libraries Association. The directory is operated as a free service to bring together clients having translation problems and language specialists competent in various fields of science and technology. The directory has been housed at the Southwestern Research Institute, San Antonio, Texas, under the management of Wayne Kalenich, librarian. The directory already lists specialists capable of handling 23 different languages.

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Acquires Troxide Distribution

MacDermid Inc. of Waterbury, Conn., has announced the purchase of the manufacturing and distribution rights of Troxide compounds from the Waverly Petroleum Products Co. of Philadelphia. Thomas F. O'Brien, who formerly headed the industrial chemical division of Waverly, will take charge of a newly formed department to promote Troxide and allied compounds for metal finishing and to assist in the development of new MacDermid products.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

EAST

PROPERLY QUALIFIED ENGINEER: To engage in process development work on titanium metal. Applicant should have good technical background in metallurgical or mechanical engineering. At least five years' firsthand experience with the melting, rolling and processing of stainless and alloy steels essential. A good measure of experimental and processing resourcefulness also required. Salary open. Box 7-125.

METALLURGICAL ENGINEER: College graduate, age 35 or under. Must have at least five years' experience in industrial plant laboratory and heat treat. Excellent opportunity in metallurgical department of a successful and well-established company. Plant employs about 1500 men. Box 7-130.

MANAGER ENGINEERING SERVICE DIVISION: Wanted by well-known manufacturer of electrodes and welding metals nationally advertised and distributed. Ambitious engineer or metallurgist, free to travel, knowledge of manual application of all welding processes, good speaker, writing ability substantiated by published papers on welding, well poised, instructor in welding courses. Salary commensurate with past earnings. Submit complete resumé and salary desired. Box 7-5.

MIDWEST

METALLURGICAL SALES DEVELOPMENT: Attractive and responsible position in Chicago for a graduate metallurgical engineer, 32 to 38 years old, who has had experience in the processing and application of alloy steel. Box 7-10.

METALLURGICAL SALES DEVELOPMENT: Attractive position available in Detroit for a graduate metallurgical engineer who is 30 to 36 years old and who has had experience in the production of cast iron. Box 7-15.

YOUNG METALLURGIST: Preferably with M.S. degree, for research work in physical metallurgy. Excellent laboratory facilities and good opportunity for advancement in automotive plant. Location Detroit. Supply resume and photograph. Box 7-135.

MAN FAMILIAR with lost wax or precision casting of nonferrous alloys. Possible opportunity to share interest in company. Box 7-140.

WEST COAST

DISTRICT SALES MANAGER: Pacific northwest. Knowledge of electric welding. Willing to travel extensively in own car. Working with and educating distributors selling nationally known steel products for maintenance and repair of construction, mining, quarry equipment. Salary and commissions. Write giving qualifications. Box 7-20.

POSITIONS WANTED

SUPERVISOR SHEET MILL: Thirty years' diversified experience with carbon, silicon, stainless, alloy and toolsteel production. Familiar with every phase of sheet, blooming, cogging and allied practices. Some plant supervisory experience with electric melting, sheet mills, bar mills and pertinent equipment. Married, age 46; will go anywhere for permanent position with progressive firm. Box 7-25.

POWDER METALLURGIST OR RESEARCH ENGINEER: Experienced in production, development and research. Refining, reduction, sintering and processing of platinum and precious metal alloys (nine years) and tungsten and molybdenum (15 years). Interested in new developments, refractory and rare metals, their alloys and carbide combinations. Chemical engineering graduate from University of Toronto in 1923. Box 7-80.

PRECISION CASTING: Plant manager, Five years' experience—ferrous and nonferrous. Graduate metallurgical chemist. Successful solving technical and production problems. Can take over existing plant or set one up from scratch. Resumé available. Salary $10,000. Box 7-35.

METALLURGICAL ENGINEER: B.S. in Met. Eng., Univ. of Pittsburgh. Age 26; married; one child. Interested in operations or production end of ferrous foundry or openhearth. Cleveland area preferred. Box 7-40.

PLANT EXECUTIVE: Met. E. in 1932, age 39, married, currently employed but available Aug. 1. Seventeen years' experience as sheet mill metallurgist and plant superintendent. Experience includes customer contact work on new developments and trouble shooting. Coated and uncoated sheet steel. Box 7-45.

METALLURGICAL ENGINEER: B.S. and year of graduate research. Age 26, married. Three years' experience in production heat treating, electroplating, and quality control. Thorough knowledge of coordination of heat treatment and machining operations. Qualified in furnace maintenance and instrumentation. Physical testing and metallographic laboratory work included. Two years' experience in electronics. Box 7-50.

METALLURGICAL ENGINEER: Fifteen years' experience in iron, steel and special alloys foundries; iron and steel castings, rolls; Alnico alloys, manganese and other special alloy castings. Qualified to superintend foundry, head research department, act as technical assistant to executive or direct technical sales. Box 7-55.

METALLURGIST: ScD., with 12 years' practical steel mill experience in tool, alloy, high speed and stainless steels; six years of college teaching, several publications and patents. Now employed, but desires change of employment. Box 7-60.

METALLURGICAL CHEMIST: Long experience in nonferrous smelting. Has laboratory available and some time for outside analyses and research. Reasonable cost. Located in Massachusetts. Box 7-65.

METALLURGIST: Age 29. Degree in metallurgical engineering. Experienced in physical testing, assay work, electrolytic silver-gold production, and in experimental powder metals laboratory for a short time. Desires position in or leading to production work in Midwest or eastern U. S. Box 7-70.

SALES ENGINEER: Age 30, B.S. in metallurgical engineering, proven initiative. Diversified experience in production of aluminum and magnesium wrought commodities and products. Past four years spent in successful development of new applications and products for light metals. Desires position of sales engineer or technical assistant to administrative executive in the East. Box 7-75.

JUNIOR METALLURGIST: Recent graduate of Michigan College of Mining and Technology. Six months' experience in automotive materials testing. Desires research or development work with medium sized or large concern. Midwest preferred. Box 7-30.

METALLURGIST: B.S. in metallurgy. Age 39. Five years' experience in nearly all phases of steelmaking, rolling. Three and one-half years' in fabrication field. Served as chief metallurgist in charge of 36 people. Desires responsible position in steel fabrication. Experience in flash butt welding. Box 7-85.

CHEMICAL ENGINEER: B. Ch. E., 1943. Age 27, married, 2 children. Six years' experience in field of development and research on porous membranes including furnace, pilot plant design and powder evaluation. Desires position in powder metallurgy or development engineering. Box 7-90.

WELDING METALLURGIST: B.S. in metallurgical engineering. Age 29, married, 1 child. Five and one-half years' experience in welding research and development. Thorough knowledge of all welding processes (manual and automatic), weldability, metallurgy, heat treatment, metallography and physical testing. Presently employed. Desires position in progressive company with future. Location unimportant. Box 7-95.

INDUSTRIAL AND MANAGEMENT ENGINEER: Experienced in interdepartmental coordination, improvement of manufacturing processes, correlation of costs to sales, development of products. Stainless welded and seamless tubes, carbon tubes, copper and brass industry and heavy machinery. Salary in relation to responsibilities and location. Box 7-100.

METALLURGICAL ENGINEER: Graduate of Queen's University, Kingston, Ont. Age 30, married, not employed at present. Three and one-half years' experience in rolling fabricating. Good background in teaching in a Canadian university. Desires supervisory position in industry or opportunity to do industrial research. Willing to assume responsibility. Box 7-105.

METALLURGICAL ENGINEER: B.S., recent graduate. Mechanically inclined. Eager to start at the bottom and work up. Interested in development and research, sales, and production. Two years' experience with aircraft metals inspection. Some experience in detail and arrangement drafting. Desires position in Northeast. Age 26, married. Box 7-110.

MECHANICAL ENGINEER: B. S. M. E., M.B.A., licensed professional engineer. Age 32. Management, production, industrial relations, industrial engineering, design, maintenance experience. Two years' heat treat experience. Basic knowledge of forging, metallurgy, machining and welding. Desires permanent position where experience and education can be utilized. Box 7-115.

METALLURGIST: B.S. in Met. Eng. Age 30, married. Seven years' experience—2 years nonferrous, 5 years ferrous. Experienced in production, and tool and die steels, analytical chemistry, investigation of service failures, forging, plating, physical testing of finished products, commercial steel treating. Desires responsible position with opportunity for advancement. Box 7-120.

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MANUFACTURERS' LITERATURE

297. Blackening Process

Literature on procedures now available in new tumbling techniques for blackening and coloring. Enthone Inc.

298. Castings, Beryllium Copper

Bulletin 11 entitled "Beryllium Copper Investment Casting" gives full data for the first time on economical use of precision-cast beryllium copper for industrial parts. Beryllium Corp.

299. Core Baking

Two new data sheets outline the fundamentals of electronic core-baking and describe how the new resin binder is used to great advantage. New data sheets will follow each month. Induction Heating Corp.

300. Electrodes, Container

Announcing a new Arcaloy AC-DC stainless electrode and new all-steel, moisture-proof and grease-proof container. Packed in containers made to simplify stock problems, these new electrodes produce the cleanest welds in the industry. Alloy Rods Co.

301. Forging Rods

"Titan Forging Rods and Shapes" is the title of a new folder giving the chemical compositions of ten brass and bronze alloys used. Typical brass forgings are illustrated. Titan Metal Mfg. Co.

302. Gas Burners

Bulletin 58 describes, with burner charts and drawings, certified combustion made possible with new series of gas burners. North American Mfg. Co.

303. Gas Pumps

Bulletin 32-33-B-13 gives full details on Rotary Positive Gas Pumps, illustrating four standard types with sectional drawings and photos of typical installations. Roots-Connersville Blower Corp.

304. Hardening, Flame

Latest copy of Tempil Topics gives a concise summary of the flame hardening process. Tempil Corp.

305. Hardness Tester

New Kentron micro hardness tester described in bulletin K-49, along with other important testing aids such as the Knoop and Diamond Pyramid Indenters. Kent Cliff Laboratories

306. Heat Treating

Five booklets now available describe fully with interesting illustrations the different heat-bath processes including carburizing, tempering, and a superior black finish. Heatbath Corp.

307. Irons, Silicon

New data collected over ten to fifteen years on two corrosion resistant high silicon alloys, Duriron and Durichlor, now available in bulletin 113. Duriron Co., Inc.

308. Metal Engineering Data

New 8-page bulletin gives engineering data including load deflection, air flow comparison, and free openings of both standard and flattened mesh types of expanded steel. Jos. T. Ryerson & Son, Inc.

309. Press, Hydraulic

Straightening, forming, broaching and assembling operations all competently and economically handled by the new hydraulic metalworking press just developed. Niagara Machine & Tool Wks.

310. Surface Control

New 8-page bulletin gives numerous practical advantages of shop control for surface roughness and waviness. Write for "More Profits to You Through Surface Control". Physicists Research Co.

311. Technical Course

Complete training course for technical service representatives attractively presented in special 40th anniversary issue of house organ. Series of photographs follow trainees through the most interesting phases of the course from laboratory to field work lectures. Oakite Products, Inc.

312. Tube Furnace

New electric tube furnace especially designed for general research work. Materials can be tested to maximum temperature and cooled quickly. Bulletin gives full description and also typical heating and cooling curves. Harper Electric Furnace Corp.

313. Valves

Bulletin 711 includes the latest information on forged steel relief valves, designed for basic steam, oil or vapor working pressure of 600 lb. at 850° F. Edward Valves, Inc.

314. Wire

New 7-page booklet furnishes latest information on Colmonoy Sprayweld Wire designed for use in standard metallizing guns. Wall Colmonoy Corp.

READER SERVICE COUPON

Metals Review, July 1949

Circle these numbers for manufacturers' catalogs described on this page.

297	299	301	303	305	307	309	311	313
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Circle these numbers for information about new products described on pages 60 through 63.

837	839	841	843	845	847	849
838	840	842	844	846	848	

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NEW PRODUCTS *in Review*

837. Automatic Ladling

Automatic ladling, a new development in removing molten aluminum from melting furnace to die casting machine, has been announced by Lindberg Engineering Co.

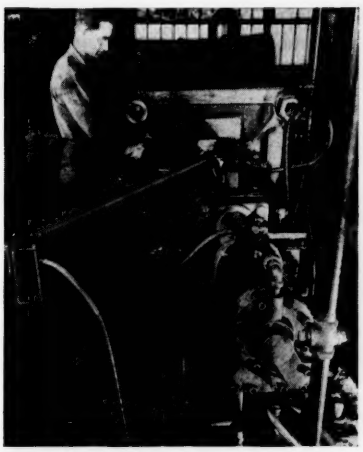
Design of the automatic ladling mechanism is a direct outgrowth of Lindberg's recent development of a new two-chamber induction melting furnace.

Operation of the ladling unit is extremely simple. The discharge side of the furnace is sealed over with a metal plate through which extends a refractory tube. By means of a hollow graphite block and a graphite tube mounted on the furnace cover, the discharge chamber is connected to the injection sleeve just ahead of the piston.

Also extending through the cover is a pressure line connected to a nitrogen tank. This nitrogen line has a pressure control and solenoid valve. A timer synchronized with the controls of the die casting machine opens the valve to admit approximately 1 lb. of pressure to the surface of the molten metal.

By controlling three factors carefully—length of time pressure is applied, the amount of pressure, and the diameter of the graphite pipe—the quantity of molten metal forced into the die casting machine can be accurately controlled.

For the story of nitrogen ladling, write Quinten Kenny, Lindberg Engineering Co., 2444 West Hubbard St., Chicago 12, or use coupon on page 60, circling No. 837.



838. Nylon Anode Bags

Nylon anode bags to cover nickel, copper, silver, zinc and other metal anodes used in electroplating solutions are said to be over 50% stronger than comparable cotton bags. In addition, tests have indicated that the strength of these bags is maintained in both acid and alkaline solutions at temperatures up to 150° F. for long periods of time. For example, when put in a bright nickel plating solution operating at a pH of 3.5, after two months of immersion no measurable change in bursting strength or tear strength could be determined.

The bags are ordinarily supplied 4 in. longer than the anode to allow accumulation of sludge; a nylon draw cord is also provided. Cost is equal to or less than that of cotton bags.

For further information write Walter R. Meyer, Enthone, Inc., Department MTR, 442 Elm St., New Haven 2, Conn., or use coupon on page 60, circling No. 838.

839. Bar Solders

A new type of tin-lead bar solder, announced by Federated Metals Division of American Smelting and Refining Co., is sold under the trade name of "Castomatic". The solders are manufactured by patented casting machines which operate on the die casting principle, modified and improved upon by Federated metallurgists and engineers.

For generations it has been the accepted procedure in the metalworking industry to cast solder bars by hand—a process that leaves much to be desired. The Castomatic equipment eliminates the deficiencies of manual casting, and produces a solder of greater uniformity, finer structure and superior quality.

In the Castomatic machine, the molten solder is contained in a completely closed system from melting kettle to mold. All operations are fully automatic, and each step in the manufacturing cycle is timed to fractions of a second by electronic controls.

Because the system is closed to air, oxides in the metal are eliminated and the solders have improved fluidity and easier working properties. Composition is uniform to a degree previously unobtainable, and weight varies only a few grams in 1½-lb. bars.

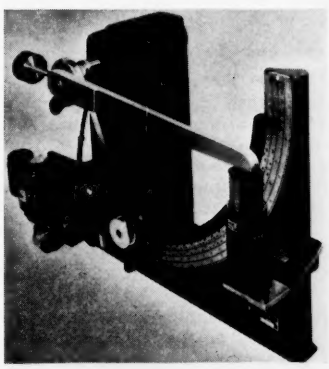
Segregation, not at all uncommon in hand-cast bars, is virtually eliminated. This insures a uniform melting temperature from one end of the bar to the other, and adds to soldering ease and efficiency. Precisely controlled cooling conditions in the Castomatic system give an unusually fine grain structure and lack of voids in the bars. The surface is markedly brighter and cleaner than that of hand-cast bars.

For further information write A. E. St. John, Federated Metals Division, American Smelting and Refining Co., 120 Broadway, New York 5, or use coupon on page 60, circling No. 839.

840. Sand Strength Accessory

A green core strength accessory is designed to improve the accuracy of the green compression test on relatively weak core sand. It attaches readily to the universal sand strength machine.

Loading is applied at a controlled rate by the regular motor drive or by a hand wheel. The specimen is stripped directly on the accessory, thus reducing air dry time and assuring perfect seating on the support post. Breaking strength is found by multiplying the green compression scale reading by ten.



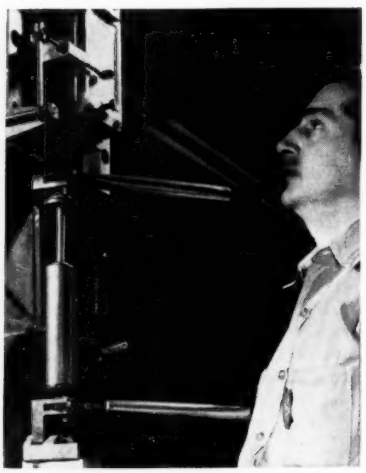
For further information write Jess Toth, Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, or use coupon on page 60, circling No. 840.

NEW PRODUCTS *in Review*

841. Electricweld Tubing

Use of Electricweld tubing of free-machining steel to reduce costs in the manufacture of airplane-type shock absorbers for automobiles is reported at the Houde Engineering Division of Houdaille-Hershey Corp.

Basically, the shock absorber consists of a piston and cylinder assembly housed in a casing and protected by a dust shield. To operate efficiently, the piston and cylinder must be machined with uniform precision to exacting tolerances. Houdaille meets these requirements in the manufacture of cylinders by making them from Jones & Laughlin Steel Corp.'s Electricweld tubing of resulphurized free-machining openhearth steel. The interior surface of this tubing is machined to a tolerance of 0.001 in., by broaching. Otherwise, expensive drawn-over-mandrel tubing would have to be used in this application.



Shock Absorber Made of Electricweld Tubing Being Tested for Rebound and Compression Performance

Jones & Laughlin is also producing Electricweld tubing in unusual shapes for streamlined modern design, and in square, rectangular, and oval shapes. Tubing in various shapes is widely used in the furniture, automotive and other industries for eye-appeal and structural advantages.

For further information write Robert Mossman, Jones & Laughlin Steel Corp., Pittsburgh 30, or use coupon on page 60, circling No. 841.

842. Thickness Gage

A new instrument designed to measure continuously the thickness of sheet materials moving along a conveyer without contacting or disturbing the material is called the beta-ray thickness gage. It is intended for monitoring the thickness of metal foils such as aluminum, copper, tin, brass, and steel, being rolled at high speeds.

In operation, the beta-ray thickness gage measures the deviation from a chosen setting by registering the amount of beta rays which the material under test absorbs. While the device actually indicates the mass per unit area of the material, it can be calibrated in terms of thickness.

The source of beta-rays in the gage is 2.5 millicuries of strontium-90, a radioactive isotope. Those rays unabsorbed by the material passing through the gaging head are gathered in an ionization chamber. An attenuated 90-cycle signal is added in phase opposition to cancel the signal from the ionization chamber. The attenuator voltage, therefore, is a measure of the ionization chamber voltage, and of the amount of material in the beta-ray beam.

Operating on a power supply of 100 to 125 volts, 60 cycles, power consumption of the gage is about 150 watts. Accuracy is ±2% or better between normal periods of calibration, while drift is not more than 1% per hr. after a 30-min. warm-up period. Under normal conditions, calibration need not be made oftener than once every four hours.

For further information write W. F. Stolberg, General Electric Co., Schenectady 5, N. Y., or use coupon on page 60, circling No. 842.

843. Brazing Machine

Three different gages of tubular aluminum are brazed, with only a 50° temperature differential between the flow point of the brazing alloy and the burning point of the components, at the rate of 500 assemblies per hour on a special-purpose automatic gas-fired machine produced by Selas Corp. of America. The production rate is ten times that of the displaced hand operation.

The two-stage machine has 16 soft-flame gas burners, each controlled for heat input and placed to give the required brazing-heat patterns. Water cooling in the first stage provides for the comfort of the operator.

Unit With Three Different Gages of Aluminum, Brazed on Special-Purpose Machine. A is complete unit; B first operation (Arrows show joints)

A variable speed control is synchronized with the time-heat requirements.

The correct combustion mixture of gas and air is supplied at constant pressure to the brazing machine by a Selas combustion controller. The installation is equipped with Selas fire checks.

The principle of this equipment can be applied to brazing operations that require exact control of temperature and area to be heated.

For further information write Charles Cunningham, Selas Corp. of America, Erie Ave. and D St., Philadelphia 34, or use coupon on page 60, circling No. 843.

844. Precision Castings

Accurate "lost-wax" precision castings in almost any metal are being produced by Precision Metalsmiths, Inc. An example is the sewing machine shuttle shown in the photograph. This casting is made of tough beryllium-nickel, which machines easily in the annealed form, and yet may be heat treated to a Rockwell hardness of better than C-50.

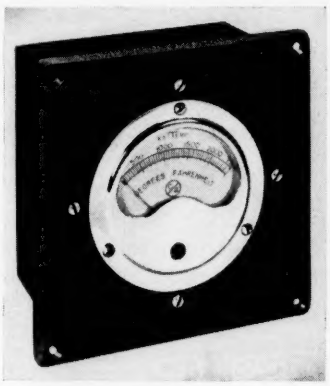
The production cost of this part made by another method was formerly $1.19. The cost of the precision-cast part is $.45, and with less than 5 min. grinding time on the outside diameter, the total production cost is $.70, thus effecting a saving of nearly 70%.

For further information write F. S. Martin, Jr., Precision Metalsmiths, Inc., 6511 Cedar Ave., Cleveland, or use coupon on page 60, circling No. 844.

845. Thermocouple Indicator

An economical high-temperature indicator for general, non-critical use has been announced by the Claud S. Gordon Co. as the Model XA-100 Xactemp indicator. The meter is claimed to be accurate within a fraction of a scale division. It is calibrated for either iron-constantan or chromel-alumel thermocouples, and a choice of several scale ranges is available.

Xactemp thermocouple indicator is furnished in a metal case suitable for



either flush or surface mounting. A plug-in lead-wire connection provides easy handling.

For further information write Vincent Manka, Claud S. Gordon Co., 3000 South Wallace St., Chicago 16, or use coupon on page 60, circling No. 845.

846. Atmosphere Generator

The Baker Nitroneal generator is designed to produce a superior annealing gas whose composition can be accurately varied at will. In this simple and inexpensive unit anhydrous ammonia is interacted with air in the presence of an Englehard catalyst to form nitrogen and hydrogen. The hydrogen content is controlled within a range of ½ to 25%, and is maintained at the determined figure within close tolerance. There is a gain of two volumes of nitrogen for each volume of hydrogen removed.

A prime advantage of the new unit lies in its cost saving. On the basis of $2.80 for cylinders of nitrogen or annealing gas of 200 cu. ft. maximum capacity, or $14 per 1,000 cu. ft., savings amount to more than $2.30 per cylinder, or about $12 per 1,000 cu. ft. If tank car rather than ammonia is used to operate the Nitroneal generator the cost of the finished gas is reduced to about 40c per 1,000 cu. ft.

Air and liquid ammonia are fed to the generator at room temperature and at pressures of approximately 10 and 20 lb., respectively. The finished annealing gas comes from the unit at only slightly above room temperature and at a pressure of 1 lb. or more, as desired. It is saturated with water vapor, which is readily removable by any standard dryer.

The Nitroneal generator is a complete, self-contained unit, requiring no power supply except for instrumentation. It can be supplied with capacities of finished gas ranging from 100 to 10,000 cu. ft. per hr. The catalytic conversion of the raw materials eliminates all explosive mixtures, and the gas composition leaving the generator remains constant within 1% of the set point. This is verified by a direct-reading meter.

For further information write W. Bergherm, Baker & Co., Inc., East Newark, N. J., or use coupon on page 60, circling No. 846.

847. Extrusion Press

A new type oil-hydraulic extrusion press has been designed for rapid and economical production of rods and shapes from light metals and other nonferrous alloys. The machine is self-contained and requires very little floor space and minimum operating personnel. It is built in 500 and 1000 tons capacity, and can attain a production of 50 to 60 billets per hr.

It is a fast-working press designed for accessibility and quick change of dies. It will fill a need in the building, furniture and similar trades using aluminum and other light metal extrusions for window sections, ladder sides, trim moldings, ornamental and structural shapes.

For further information write Walter Kauders, Hydropress, Inc., 570 Lexington Ave., New York 22, N. Y., or use coupon on page 60, circling No. 847.

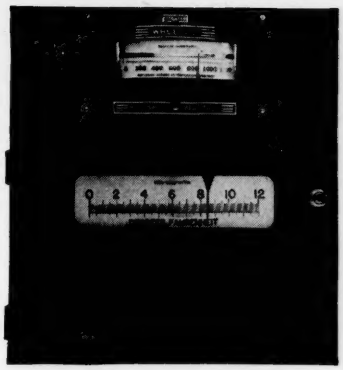
848. Electrical Outlets

The new Eberbach multi-outlet strip is for use wherever additional electrical outlets are required. It provides six standard electrical outlets 6 in. apart on a 3-ft. strip metal case. The wire tangle and danger of multiple plugs are eliminated. Laid on bench or table or fastened to the wall, the multi-outlet strip provides outlets over a convenient area for the average setup. The unit comes with heavy-duty rubber cord and plug.

For further information or literature write Lyman W. Bittman, Eberbach & Son Co., 200 East Liberty St., Ann Arbor, Mich., or use coupon on page 60, circling No. 848.

849. New Capacitrol

A new type of indicating controller named "Multi-Switch" Capacitrol, will become a part of Wheelco's Capacitrol line of controllers for temperature, voltage, amperage, pressure and speed. Incorporating such features as a "distant view scale", front accessibility, plug-in chassis design and voltage selector plug, the Multi-



Switch Capacitrol is available with a maximum of four switches (S.P.D.T.) to provide a selection of six different switching sequences for a large variety of control functions.

A direct-reading meter movement of high-resistance, fully compensated type with Alnico V magnet is used for applications which fall in the pyrometric range. Models using resistance thermometer measuring systems are available for low-temperature operation. The well-known Wheelco electronic principle is used to link the measuring and control functions.

For further information write Hans W. Bluethe, Wheelco Instruments Co., 847 West Harrison St., Chicago 7, or use coupon on page 60 circling No. 849.

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Hardening 8-15.

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